1991 RAPTOR SURVEYS
GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE

GAAR-91-001
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Abstract: Surveys for cliff nesting raptors were conducted on the Alatna, Itikmalak, Killik, Kobuk, Middle Fork of the Koyukuk, and Noatak Rivers, Gates of the Arctic National Park and Preserve, Brooks Range, Alaska, June-July 1991. Raptor observations and nest descriptions were recorded on USFWS nest observation cards and entered into a computer database. Raptor abundance was highest on the Itikmalak and Kobuk Rivers and lowest on the Alatna River. Species diversity was highest on the Kobuk and Noatak Rivers and lowest on the Alatna River. Nest abundance was highest on the cliffs along the Killik River, but 88% of the golden eagle (Aquila chrysaetos)nests (n = 17) were inactive. The highest number of active nests was found on the Noatak and Kobuk Rivers. Five active osprey (Pandion haliaetus) nests were located on the Kobuk River. Data collected on these surveys will be used to establish a long-term monitoring program for raptors on the park and preserve. By monitoring raptor population health and productivity, resource managers can detect human-related disturbances to raptor populations and make management decisions to minimize these impacts and maintain healthy raptor populations.

INTRODUCTION

Gates of the Arctic National Park and Preserve was established as a wilderness park for the purpose of maintaining the wild and undeveloped character of the area and preserving its natural environmental integrity [Alaska National Interest Lands Conservation Act (ANILCA), 1980]. Birds of prey are a critical element of the wild and undeveloped character of the park and preserve and form an integral component of the natural ecosystems within it. Additionally, ANILCA [Sec. 201 (4a)] specifically directs the National Park Service (NPS) to "protect the habitat for and the populations of . . . raptorial birds".

Seventeen raptor species have been identified within the park and preserve (Table 1). The boreal owl, though not yet reported in the park or preserve, probably inhabits the coniferous forest areas. Prior to 1991, raptor surveys were conducted on the following park and preserve rivers: Alatna (Price 1985), North Fork of the Koyukuk (Garber 1989), Killik (Garber and Flatten 1988), Itkillik (Kline and Brown 1986, Garber 1987), and Noatak (Amaral and Gardner 1986, Ball 1987, Ball 1988). Raptor surveys were conducted on foot in the Castle Mountain Unit (Ward 1985, Britten 1989) and in the Chandler Lake area (Garber and Flatten 1988). Raptor nests in the northern foothills were surveyed from the air in 1989, as were nests along the North Fork of the Koyukuk in 1990. Golden eagle nesting habitat was surveyed by C. McIntyre (1987). Incidental nest sightings by rangers and visitors as well as nest records from surveys have been entered into a computer database using dBase III+ software.

To characterize and maintain "natural and healthy" populations" of raptors in the park and preserve area, raptor populations should be monitored at regular intervals by resource managers. The objective of this project was to survey several major rivers in the park and preserve to collect information on raptor abundance, species diversity, and nest success to facilitate monitoring temporal changes in raptor populations within the park and preserve.

This study was funded through the resource management division of Gates of the Arctic National Park and Preserve. The Division of Mining and Minerals Management in the Alaska Regional Office funded the raptor survey on the Kobuk River. The following individuals assisted with fieldwork and data collection: Julie Burwell, Ken Faber, Connie Moody, Betsy Rossini, Patty Rost, Dave Schmitz, Kate Swift, and staff from Noatak Preserve. Patty Rost reviewed and editted the draft version of this report. Thanks also to our pilots--Ed Forner and Buster Points--for safe delivery and retrieval.

Table 1. Raptor species found in Gates of the Arctic National Park and Preserve, Brooks Range, Alaska.

Common Name	Species Name
Northern Goshawk	Accipiter gentilis
Sharp-shinned Hawk	Accipiter striatus
Northern Harrier	Circus cyaneus
Rough-legged Hawk	Buteo lagopus
Red-tailed Hawk (Harlan's)	Buteo jamaicensis
Golden Eagle	Aquila chrysaetos
Bald Eagle	Haliaeetus leucocephalis
Osprey	Pandion haliaetus
Gyrfalcon	Falco rusticolus
Peregrine Falcon	Falco peregrinus
Merlin	Falco columbarius
American Kestrel	Falco sparverius
Great Horned Owl	Bubo virginianus
Short-eared Owl	Asio flammeus
Snowy Owl	Nyctea scandiaca
Great Gray Owl	Strix nebulosa
Northern Hawk Owl	Surnia ulula
Boreal Owl*	Aegolius funereus

* Boreal owls have not yet been observed within the park and preserve but their presence is likely.

STUDY AREA

Gates of the Arctic National Park and Preserve is located above the Arctic Circle in the central Brooks Range, Alaska (Fig. 1). The 33,182 km^2 park and preserve unit spans 2 climate zones: the subarctic zone at low altitudes south of the Brooks Range and the arctic zone to the north. Precipitation is low within the park and preserve, ranging from 30 - 46 cm in the west to 13 - 25 cm in the north. Snow falls average 152 - 203 cm in the south and 89 - 127 cm in the north. Temperatures in the south fluctuate from an average July maximum of 19°C to an average January minimum of -31°C. Temperatures in the north fluctuate from an average July maximum of 16°C to an average February minimum of -22°C (National Park Service 1986).

Boreal forest, tundra, and shrub thickets are the major vegetation communities in the park/preserve (National Park Service 1986). The dense boreal forest south of the mountains, composed of black spruce (Picea mariana), white spruce (P. glauca), birch (Betula papyrifera), aspen (Populus tremuloides), and balsam poplar (Populus balsamifera), extends into the southern flanks and valleys of the Brooks Range. Boreal forest is replaced at treeline by shrub birch (B. nana and B. glandulosa), willow (Salix spp.), and alder (Alnus crispa and A. incana) thickets. Dense willow/alder thickets occur along stream channels and gravel bars at lower elevations. Alpine tundra is found at higher altitudes and on dry ridges and contains low-growing willow, Dryas spp., Saxifraga spp., and lichens. Moist tundra, composed primarily of cotton sedge (Eriophorum spp.), forms in moderate to poorly drained soils in the foothills, mountainsides, and river valleys.

METHODS

The Alatna, Killik, Kobuk, Middle Fork of the Koyukuk, and Noatak Rivers (Fig. 2) were surveyed for raptors and raptor nests using inflatable rafts and canoes. Tributary canyons and cliffs away from the rivers were surveyed on foot. The raptor survey in the Itikmalak River area was conducted entirely on foot.

Prior to the survey, field personnel obtained copies of all existing data for the area being surveyed. Previously recorded nest sites were revisited and evaluated for nesting activity and condition of the nest. Active nests were defined as those with brooding adults, nestlings or fledglings in or near the nest, large deposits of whitewash on or near the base of the nest, and/or other evidence of recent use. Field binoculars (7 x 24 power) and spotting scopes were used to search for and identify raptors and nests.

Raptor and nest observations were mapped on U. S. Geological Survey topographic maps (1:63,360 scale) and recorded on "Alaska Raptor Observation and Nest Record Cards" distributed by U. S.

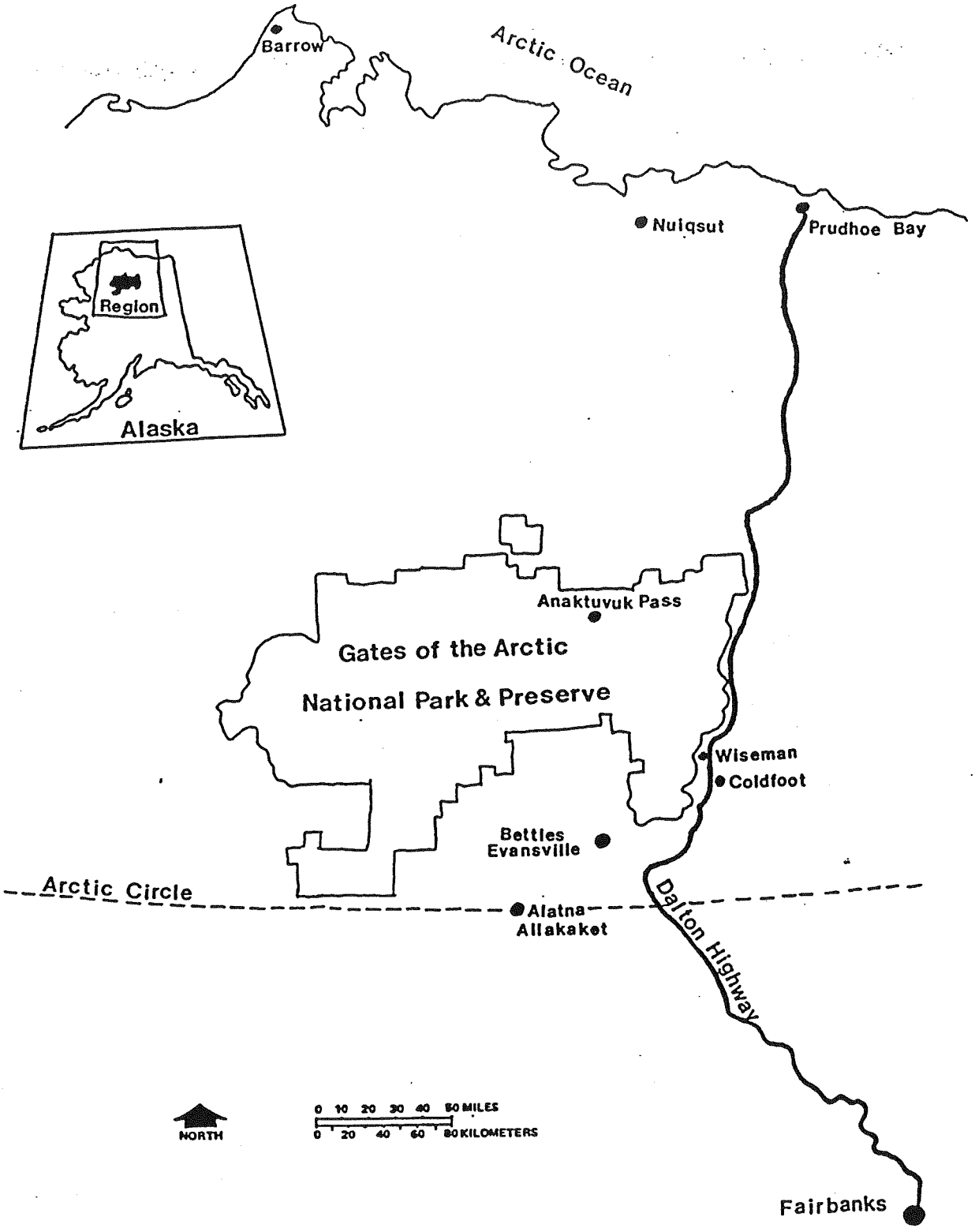


Fig. 1. Location of Gates of the Arctic National Park and Preserve, Brooks Range, Alaska.

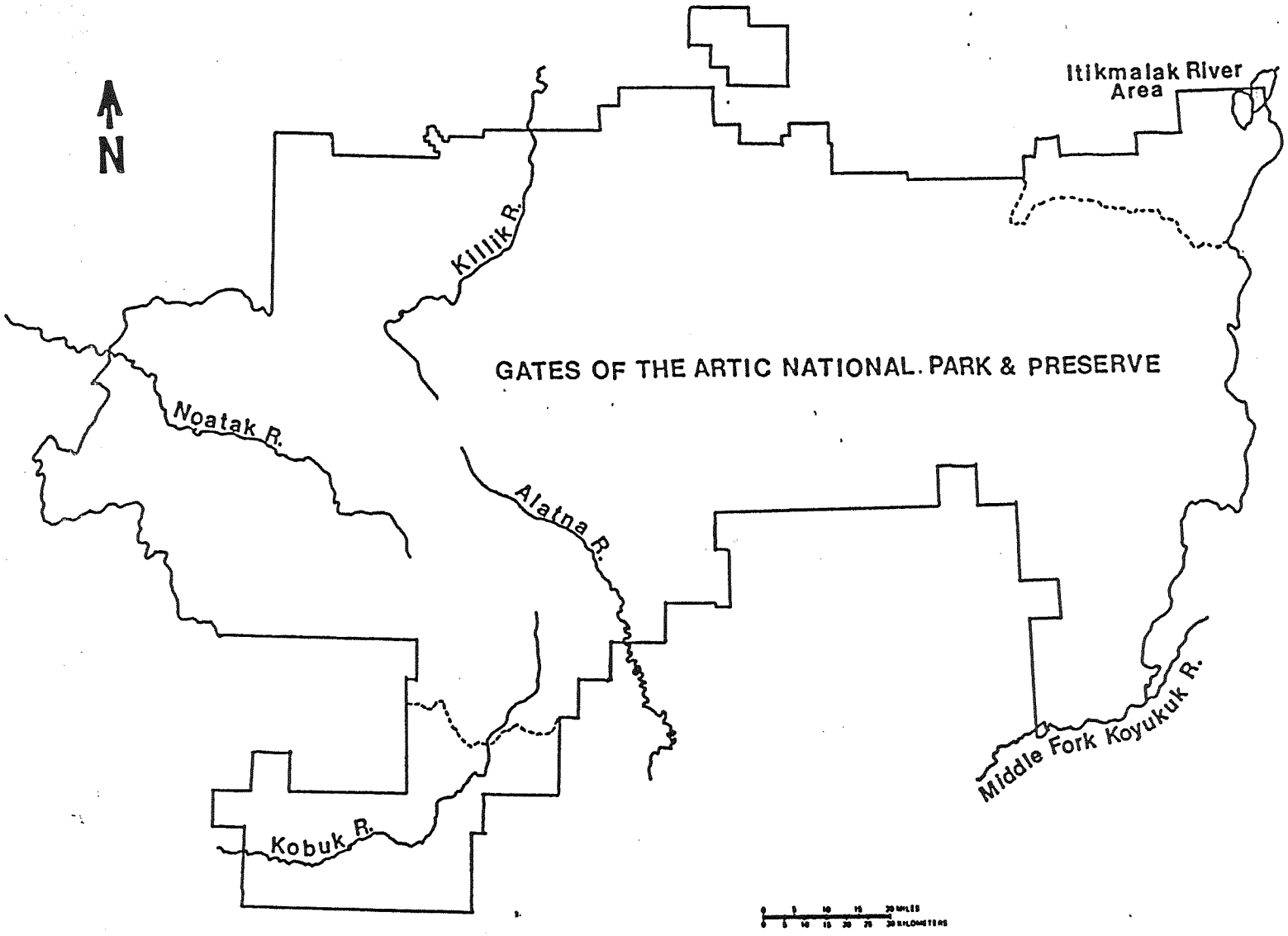


Fig. 2. Location of rivers surveyed for raptors during summer 1991, Gates of the Arctic National Park and Preserve, Alaska.

Fish and Wildlife Service (Fig. 3). Data from nest cards were entered into the raptor database file, and cards were stored in chronological order in 3-ring notebooks. Nest sites were photographed and archived. The raptor nest database for the park and preserve is described in detail in Appendix 2 in Gates of the Arctic National Park and Preserve Raptor Nest Inventory Status Report (Garber 1988).

RESULTS

Detailed descriptions of raptor observations and nest sites for the 1991 raptor surveys are located in Appendices I and II, respectively.

Alatna River Raptor Survey

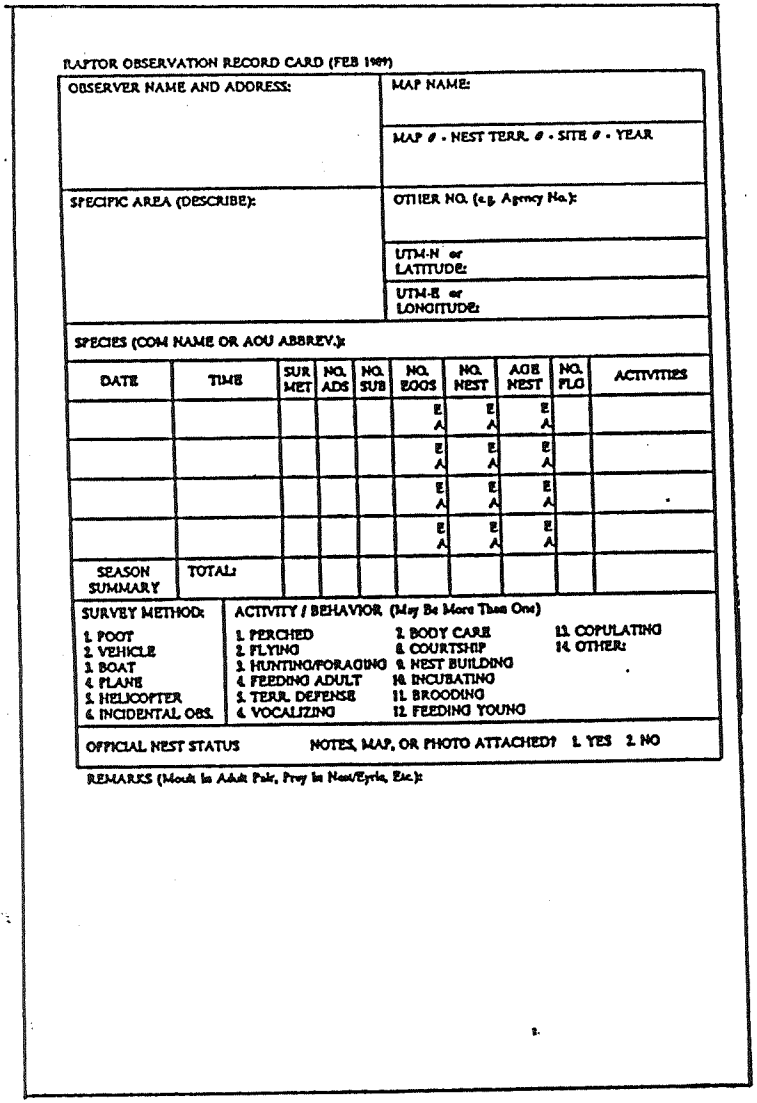
Six raptor species and 6 nest structures (Fig. 4; Table 2) were observed on the Alatna River raptor survey, 23-30 July 1991. The survey covered 117 river km from the mouth of Arrigetch Creek to the takeout point 10 km upstream from the mouth of Helpmejack Creek (Fig. 4). On the 52 km river section within park boundaries, 1 northern harrier, 2 American kestrels, 1 immature golden eagle, and 2 peregrine falcons were observed, giving an observation rate of 1.2 raptors per 10 km of river travel. Four red-tailed hawks (Harlan's race), 1 great horned owl, and 1 northern harrier were observed outside the park boundary.

Three active nests (1 peregrine falcon and 2 unidentified raptor nests) and 2 inactive golden eagle nests were located within the park, and 1 active raven nest was located on a cliff outside the park boundary (Fig.4). Nests were high on cliff faces and generally far from the river, precluding much disturbance from human boating and hiking activity.

Itikmalak River Area Raptor Survey

Four raptor species and 7 nest sites (Fig. 5; Table 2) were located on the Itikmalak survey, 16-24 June 1991. The survey covered 78 km on foot round trip from Galbraith Lake (Fig. 5). Two gyrfalcons, 4 peregrine falcons (including 2 nestlings), 4 golden eagles, and 2 rough-legged hawks were observed during the 62 km portion of the survey conducted within preserve boundaries, giving an observation rate of 1.9 raptors per 10 km of river traveled. Three rough-legged hawks and 1 peregrine falcon were observed outside the park boundary.

Four active and 3 inactive nest sites were observed during the survey (Fig. 5; Table 2). A peregrine falcon nest was located at 113-m elevation, which is high for nesting peregrine falcons in Alaska, and contained 2 white nestlings. An active raven nest was located 6 m above the peregrine falcon nest, but all young had fledged and left the nest. One rough-legged hawk nest was outside preserve boundaries. All nests in the survey



RAPTOR OBSERVATION RECORD CARD (FEB 1989)

OBSERVER NAME AND ADDRESS:

MAP NAME:

MAP # - NEST TERR. # - SITE # - YEAR

SPECIFIC AREA (DESCRIBE):

OTHER NO. (e.g. Agency No.):

UTM-N or LATITUDE:

UTM-E or LONGITUDE:

SPECIES (COM NAME OR AOU ABBREV.):

DATE	TIME	SUR MET	NO. ADS	NO. SUB	NO. EGGS	NO. NEST	AGE NEST	NO. FLG	ACTIVITIES
					E / A	E / A	E / A		
					E / A	E / A	E / A		
					E / A	E / A	E / A		
					E / A	E / A	E / A		
SEASON SUMMARY	TOTAL:								

SURVEY METHOD:
1. FOOT
2. VEHICLE
3. BOAT
4. PLANE
5. HELICOPTER
6. INCIDENTAL OBS.

ACTIVITY / BEHAVIOR (May Be More Than One)
1. PERCHED
2. FLYING
3. HUNTING/FORAGING
4. FEEDING ADULT
5. TERR. DEFENSE
6. VOCALIZING
7. BODY CARE
8. COURTSHIP
9. NEST BUILDING
10. INCUBATING
11. BROODING
12. FEEDING YOUNG
13. COPULATING
14. OTHER:

OFFICIAL NEST STATUS

NOTES, MAP, OR PHOTO ATTACHED? 1. YES 2. NO

REMARKS (Mouth to Adult Pair, Prey to Nest/Eyrie, Etc.):

RAPTOR NEST/EYRIE RECORD CARD (FEB 1989)

TREE NEST-SPECIES:
1. LIVE TREE
2. SNAG
3. NEST BOX/PLATFORM
4. ARTIFICIAL
5. CAVITY IN TREE
6. OTHER

TREE HEIGHT (M): E A

TREE DIAMETER (CM): E A

HEIGHT OF NEST IN TREE (M): E A

DOMINANT HABITAT TYPES (up to three within .5 km of nest)
1. CLIFF
2. UNVEGETATED GROUND
3. WET MEADOW
4. DWARF SHRUB MEADOW (tundra dominated by grasses or sedges)
5. GRASS MEADOW
6. DWARF SHRUB MAT (dwarf shrubs <0.4 M high)
7. LOW SHRUB THICKET (shrubs 0.5 - 1.1 M high)
8. MED. SHRUB THICKET (shrubs 1.2 - 2.4 M high)
9. TALL SHRUB THICKET (shrubs 2.5 - 5.0 M high)
10. DECIDUOUS FOREST
11. CONIFEROUS FOREST
12. MIXED DECIDUOUS-CONIFER FOREST
13. SCATTERED WOODLAND AND DWARF FOREST
14. ARTIFICIAL HABITAT
15. OTHER
16. MARINE (dist. km): E A
17. RIPARIAN (dist. km): E A
18. LACUSTRINE(LAKE) (dist. km): E A
19. RIVER / STREAM (dist. km): E A
20. OTHER PERRENIAL WATER (dist. km): E A

FOR CLIFF NESTS - ABOVE CLIFF: (habitat types)
BELOW CLIFF:

GROUND NEST - SITUATION:
1. LEDGE ON CLIFF
2. STICKNEST ON CLIFF
3. CAVITY (POTHOLE) ON CLIFF
4. OPEN HILLSIDE
5. LEVEL GROUND
6. OTHER

CLIFF ROCK TYPE: 1. SED 2. IGN 3. MET

SPEC. FORMATION:

CLIFF HEIGHT (M): E A

CLIFF LENGTH (KM): E A

HEIGHT OF NEST ON CLIFF (M): E A

ELEVATION OF NEST ABOVE SEA LEVEL (FT):

ASPECT OF SLOPE:

ASPECT OF NEST:

NEST CONDITION: 1. GOOD 2. POOR 3. REMNANT ONLY

NEST ACCESSIBILITY (to ground predators):
1. EASY
2. MOD. DIFFICULT
3. VERY DIFFICULT

DISTANCE TO HUMAN ACTIVITY (KM): E A

HUMAN ACTIVITY VISIBLE FROM NEST? 1. YES 2. NO

TYPE(S) OF HUMAN ACTIVITY:
1. TRAIL
2. ROAD
3. BOATING
4. AIRCRAFT
5. BUILDING(S)
6. AGRICULTURE
7. CONSTRUCTION
8. RESEARCH
9. MINING
10. OIL / GAS
11. LOGGING
12. OTHER:

CIRCLE ANY THAT APPLY:
1. PHOTO OF CLIFF TAKEN
2. PHOTO OF EYRIE TAKEN
3. EYRIE DESCRIP. ATTACHED
4. PREY REMAINS COLL.
5. EGG(S) COLLECTED
6. EGG SHELLS COLLECTED
7. WHITEWASH AT EYRIE
8. OTHER WHITEWASH ON CLIFF
9. OVERHANG AT EYRIE
10. AFTERNOON SHADING?: a. YES b. NO c. UNKNOWN

BANDING AND BAND RECOVERY INFORMATION

AGE	SEX	AVISE NO. - COLOR / LEG	BAND CODE - COLOR / LEG

Fig. 3. USF&WS Raptor Observation Cards used to record raptor observations and nest site information during raptor surveys conducted in Gates of the Arctic National Park and Preserve, Alaska, June - July 1991.

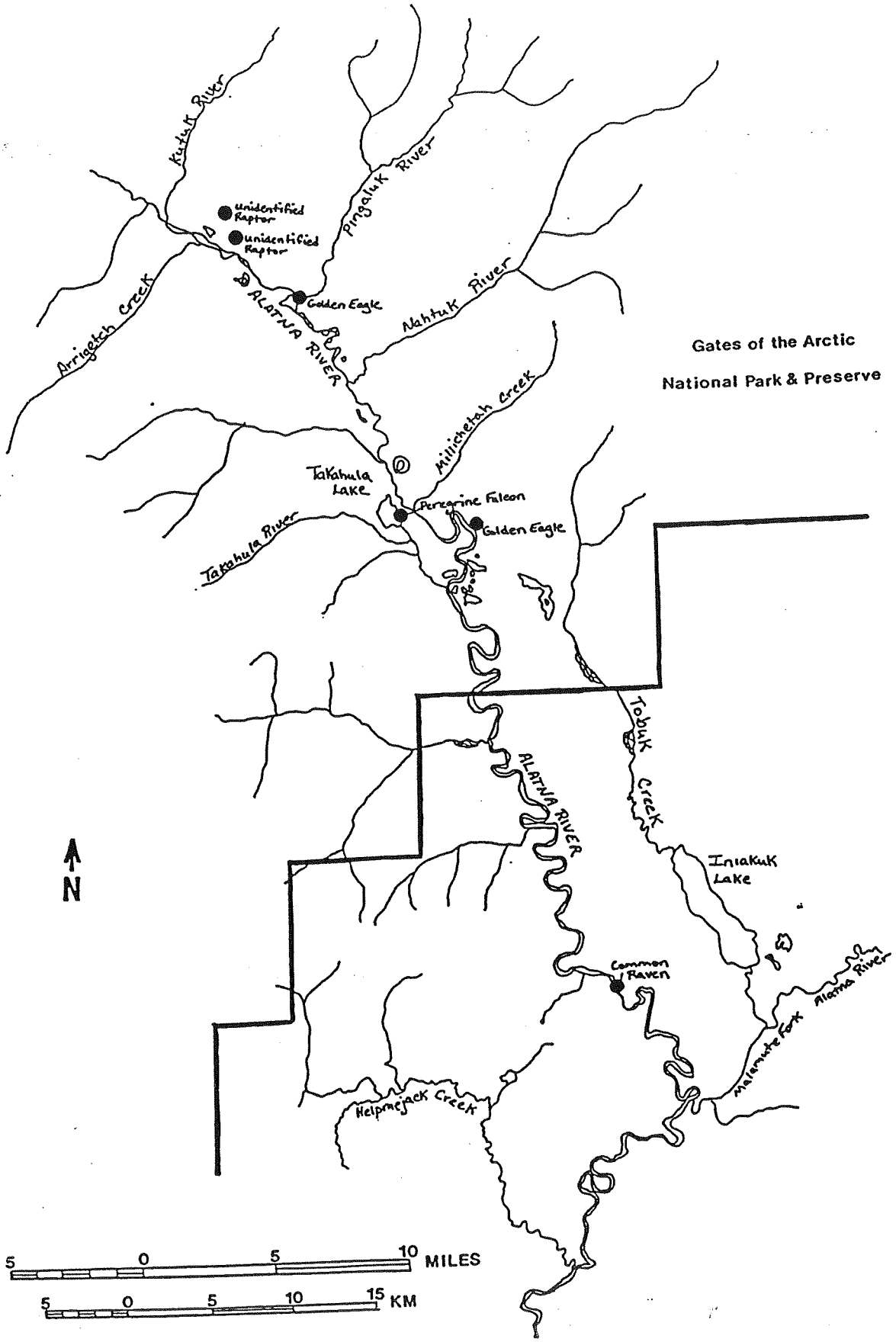


Fig. 4. Raptor nests located on the Alatna River, Gates of the Arctic National Park and Preserve, Alaska, 23-30 July 1991.

Table 2. Raptor observations (Obs.) and the number of active (A) and inactive (I) raptor nests located during surveys conducted on the Alatna, Itikmalak, and Killik Rivers in Gates of the Arctic National Park and Preserve, Alaska, June-July 1991.

Species	Alatna		Itikmalak		Killik	
	Obs.	A/I	Obs.	A/I	Obs.	A/I
Northern Harrier	3				3	
Northern Goshawk						
Rough-legged Hawk			5	2/0		
Harlan's Hawk	4					
Golden Eagle	1	0/2	4	0/1	9	2/15
Bald Eagle						
Osprey						
Gyrfalcon			2			1/0
Peregrine Falcon	2	1/0	5	1/0		
Merlin					1	
Kestrel	2					
Great Horned Owl	1					
Short-eared Owl						
Common Raven[a]		1/0		1/0		
Unidentified Raptor		2/0		0/2		

[a]Raven observations were not recorded--only nest sites.

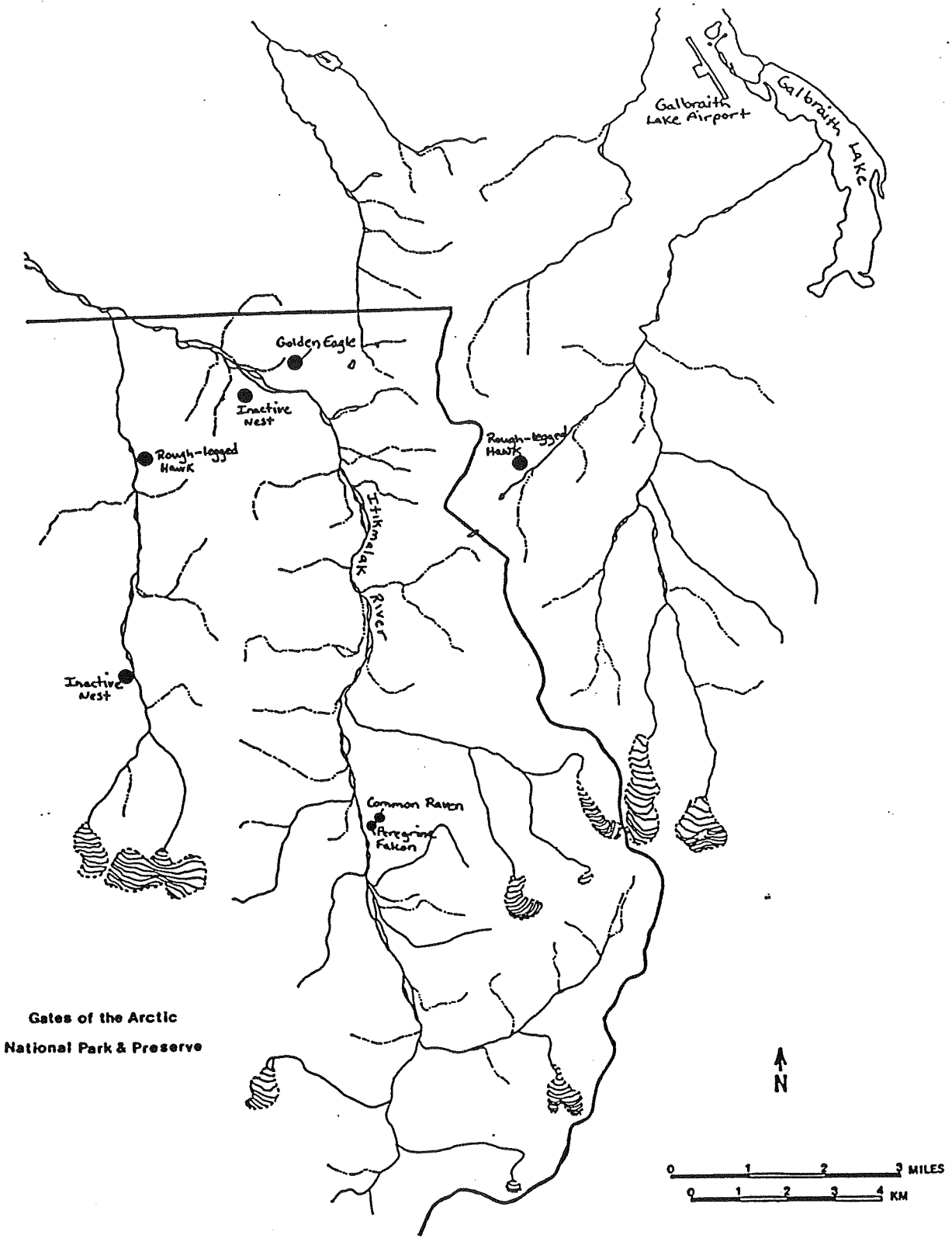


Fig. 5. Raptor nests located in the Itikmalak River Area, Gates of the Arctic National Park and Preserve, Alaska, 16-24 June 1991.

area were high on cliff faces and not easily accessible from the ground. Human hunting, hiking and aircraft activities were visible from the nest sites.

Killik River Raptor Survey

Nine golden eagles, 3 northern harriers and 1 merlin were observed on the Killik River survey, 22-31 July 1991 (Fig. 6; Table 2). The survey included 48 kilometers of river travel and 48 km of hiking. An observation rate of 1.4 raptors per 10 km of river or foot travel was obtained.

Two active golden eagle nests and 1 active gyrfalcon nest were observed during the survey (Table 2). The gyrfalcon nest was empty, but whitewash and prey remains indicated recent nest use; nestlings had fledged and left the nest prior to the survey. Fifteen inactive eagle nests were located. Cliffs in the Killik Valley were approximately 1 km from the river, so human disturbance probably is limited to float trip parties dayhiking to the cliffs, backpackers, and air traffic.

Kobuk River Raptor Survey

The Kobuk River survey, 9-16 July 1991, covered 152 km between Walker Lake and the confluence of the Pah and Kobuk Rivers (Fig. 7). Nine raptor species and 10 raptor nests (Fig. 7; Table 3) were observed despite rainy weather, wildfires, and poor visibility. An observation rate of 1.8 raptors per 10 km of river or foot travel was obtained.

Six active and 4 inactive sticknests were observed during the Kobuk survey (Fig. 7, Table 3). In addition to an active rough-legged hawk nest, 5 active osprey nests were located during the survey. Adult ospreys were brooding and vocalizing loudly, but no nestlings were observed. Old sticknests that had blown down in recent years were found under 2 of the active osprey nests. Inactive nests included 3 unidentified raptor nests and a bald eagle nest located outside the preserve boundary. Nine nests observed during the survey were located in spruce and balsam poplar trees, while 1 nest was located on a cliff pinnacle. All nests observed were within 50 m of the river, and thus birds using these nests may be highly susceptible to human disturbance from recreational boating activity.

Middle Fork of the Koyukuk River Raptor Survey

The Middle Fork survey, 25-27 June 1991, was conducted primarily to revisit a peregrine falcon nest site on the park border (Fig. 8). One great horned owl was observed and 2 peregrine falcons at a nest site (Table 3), but rain and flash flooding prevented a thorough survey of the area. Two active raven (Corvus corax) nests were located but not documented. The peregrine falcon nest (Appendix II, Table A11) was located 100 m upstream from the 1990 nest site, but was similarly located on

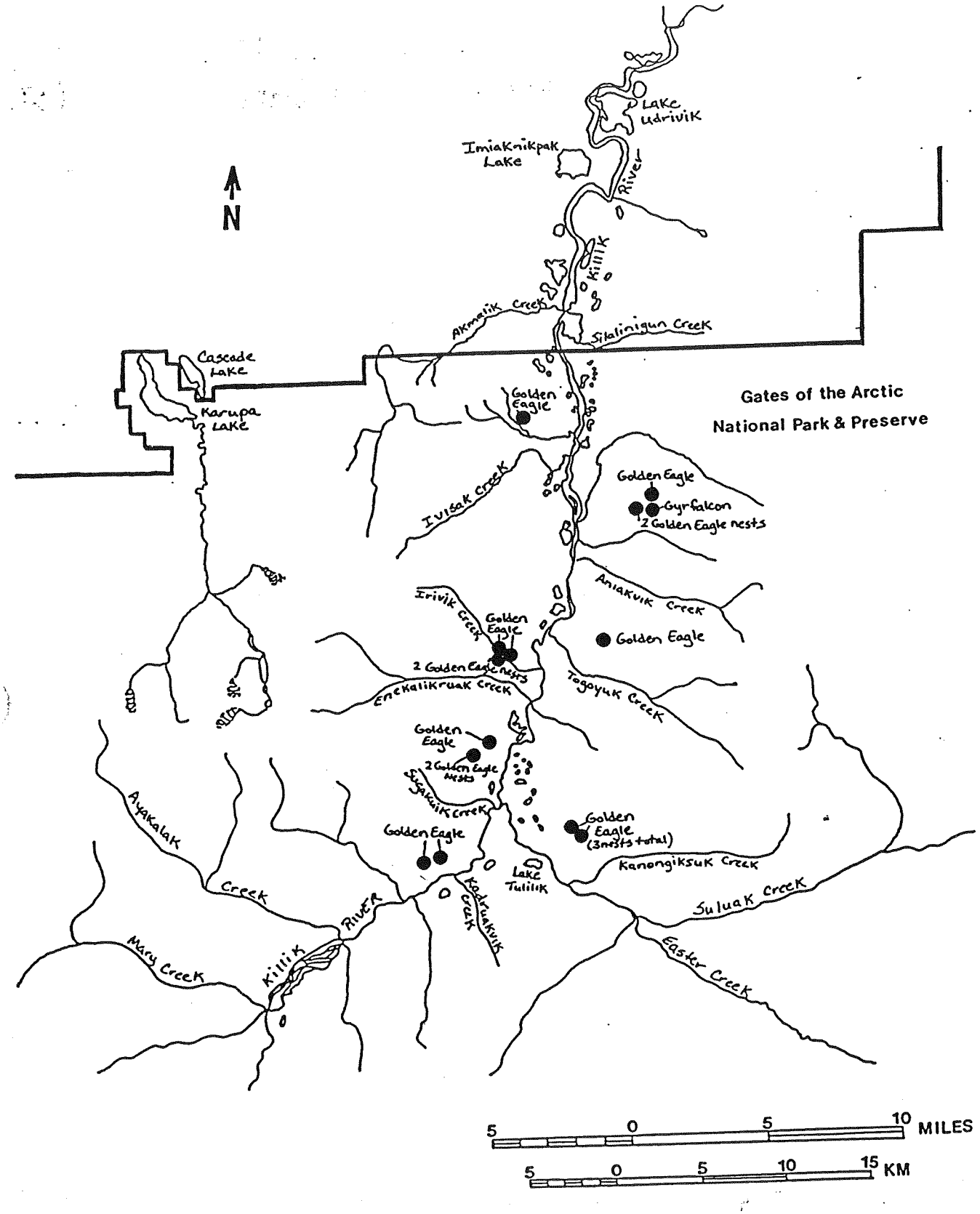


Fig. 6. Raptor nests located on the Killik River, Gates of the Arctic National Park and Preserve, Alaska, 22-31 July 1991.

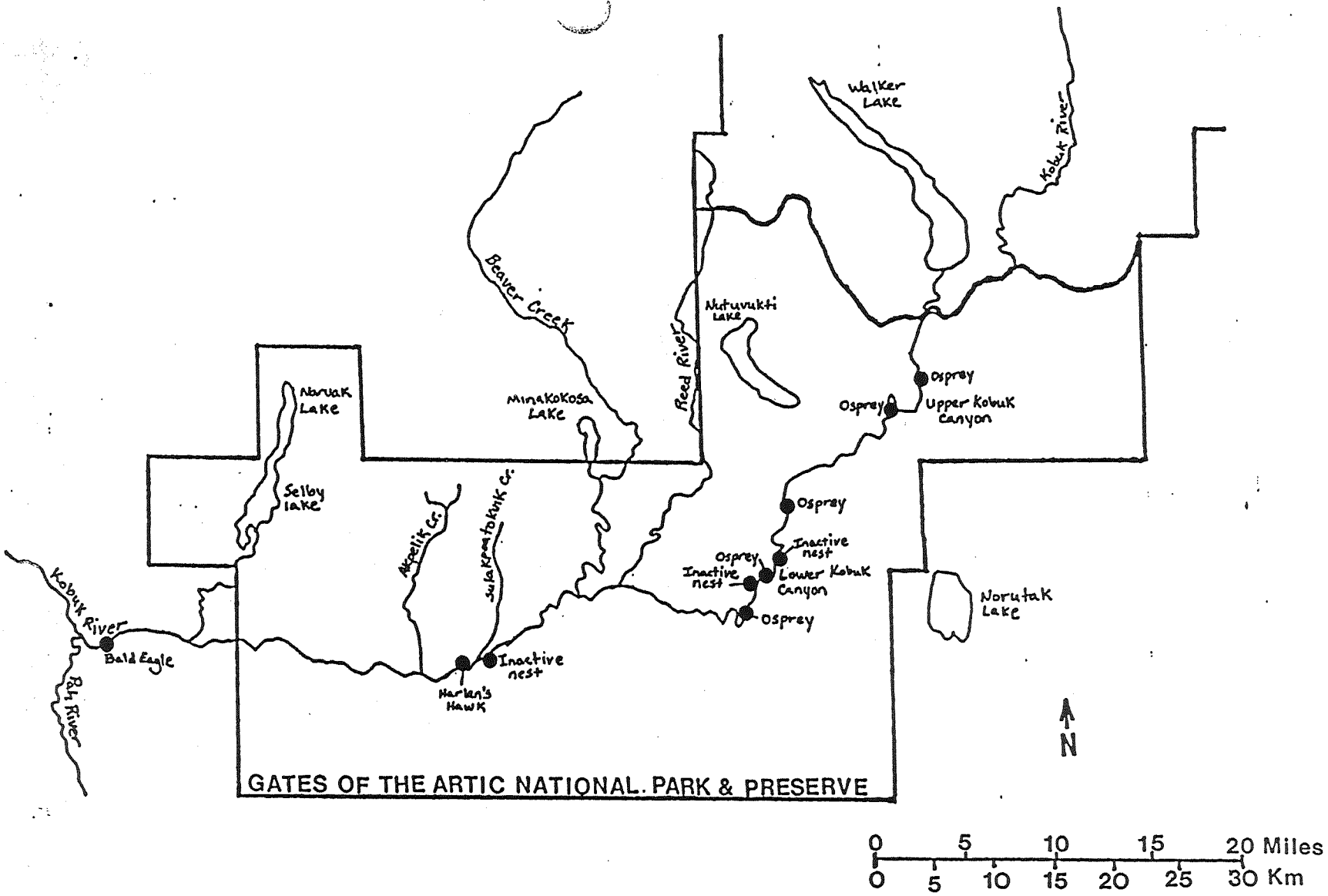


Fig. 7. Raptor nests located on the Kobuk River, Gates of the Arctic National Park and Preserve, Alaska, 9-16 July 1991.

Table 3. Raptor observations (Obs.) and the number of active (A) and inactive (I) raptor nests located during surveys conducted on the Kobuk, Middle Fork of the Koyukuk, and Noatak Rivers in Gates of the Arctic National Park and Preserve, Alaska, June-July 1991.

Species	Kobuk		Middle Fork		Noatak	
	Obs.	A/I	Obs.	A/I	Obs.	A/I
Northern Harrier	2				3	
Northern Goshawk	1					
Rough-legged Hawk	3				2	1/0
Harlan's Hawk	4	1/0				
Golden Eagle					8	2/5
Bald Eagle	3	0/1				
Osprey	12	5/0				
Gyrfalcon					5	2/1
Peregrine Falcon	1		2	1/0	2	1/1
Merlin					2	
Kestrel						
Great Horned Owl	1		1			
Short-eared Owl	1				2	
Common Raven[a]						1/0
Unidentified Raptor		0/3				

[a]Raven observations were not recorded--only nest sites.

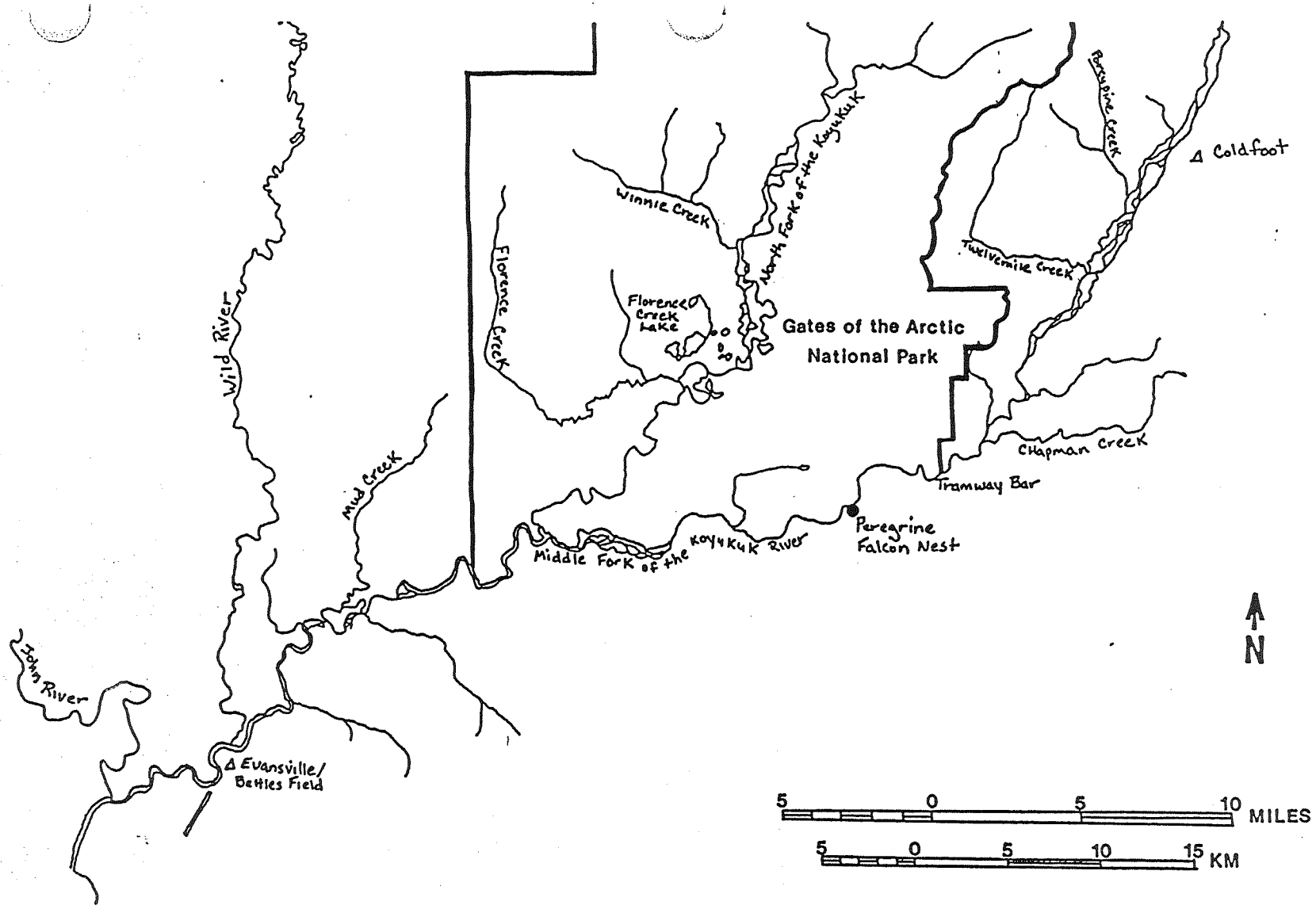


Fig. 8. Raptor nests located on the Middle Fork of the Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, 25-27 June 1991.

the ground at the base of an intermediate cliff. No young birds were heard or seen. Boating activity and mining operations appear to be the major human disturbances occurring in the nest vicinity.

Noatak River Raptor Survey

The Noatak River survey, 10-22 June 1991, was a joint effort between staff of Noatak National Preserve and Gates of the Arctic National Park and Preserve. The survey covered the entire Noatak River, but this report deals only with the section surveyed between Twelve Mile Slough and 5 km beyond the park boundary (Fig. 9); additional raptor nests located in the Noatak National Preserve are documented in the 1991 Noatak River Raptor Survey Report (Wildman 1991). Within the park, 82 river kilometers were floated while surveying for raptors and 80 km were surveyed on land by foot. The following 7 raptor species were identified during the survey: golden eagle, gyrfalcon, northern harrier, short-eared owl, merlin, rough-legged hawk, and peregrine falcon (Table 3). An observation rate of 1.4 raptors per 10 km of river or foot travel was obtained.

During the survey, 7 active and 7 inactive nests were located between Twelve Mile Slough and the point 5 km from the park boundary (Fig. 9; Table 3). Active nests were observed for the rough-legged hawk, golden eagle, gyrfalcon, peregrine falcon, and raven (Table 3). Five inactive golden eagle nests were found as well as 1 inactive gyrfalcon nest and 1 inactive raven nest.

DISCUSSION

Raptor Abundance and Species Diversity

Raptor abundance and species diversity varied between the 6 river areas surveyed. Based on the number of raptors observed per 10 km of boat or foot travel, the Itikmalak River area and the Kobuk River had the highest abundance of raptors. The Alatna River had the lowest raptor abundance. Species diversity was highest on the Kobuk and Noatak rivers, but species composition varied between the 2 rivers, with more boreal forest species observed along the Kobuk River and more open-country/tundra species found on the Noatak River (Table 3). Gyrfalcons, golden eagles, and rough-legged hawks were most numerous in the north slope area, including the Itikmalak and Killik rivers, and on the higher elevation Noatak River where nesting cliffs and open habitat for hunting were available. The lower elevation Kobuk River had few nesting cliffs, but the riparian boreal forest habitat was conducive to tree-nesting raptor species such as Harlan's hawk, northern goshawk, great horned owl, and bald eagle.

Several raptor species had limited distributions within the park and preserve. The only confirmed population of nesting

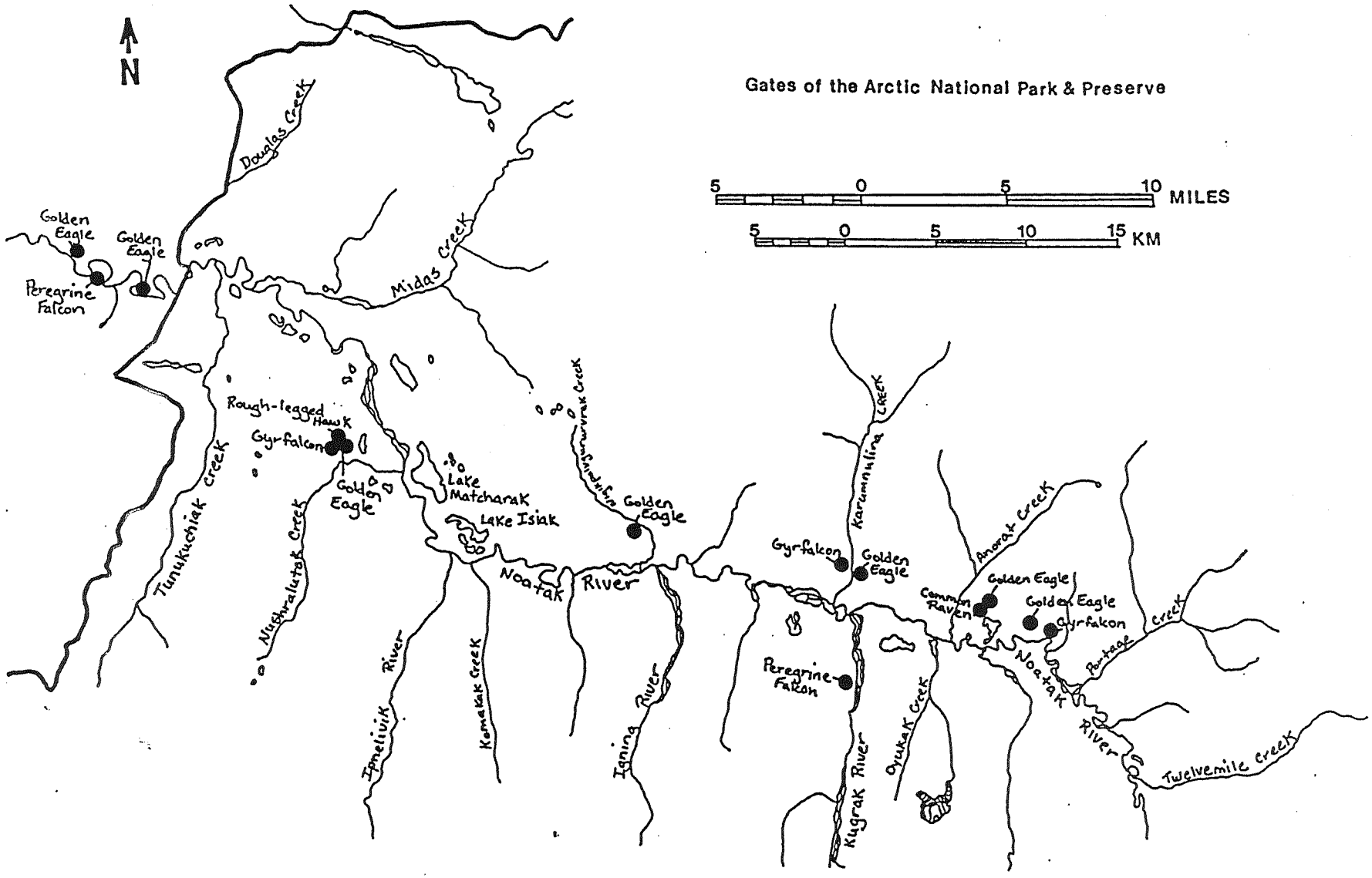


Fig. 9. Raptor nests located on the Noatak River, Gates of the Arctic National Park and Preserve, Alaska, 10-22 June 1991.

ospreys in the park and preserve is located on the fish-rich Kobuk River. An osprey observation was reported on the North Fork of the Koyukuk in 1986, and a possible osprey nest was observed in the same vicinity in 1988; the nest site was rechecked in 1989, but neither nest nor birds were located. The only bald eagles observed during the surveys were also on the Kobuk River, but a documented bald eagle nest site and bald eagle observations exist for the North Fork Koyukuk River. Bald eagle observations also have been made on the John and Wild Rivers outside park boundaries.

Northern harriers were distributed throughout the park and preserve in wetland areas and were observed on all surveys except the Itikmalak and Middle Fork Koyukuk rivers. The Itikmalak area was relatively high in elevation and well-drained, providing little northern harrier habitat. However, numerous northern harrier sightings have been recorded for the wetter Itkillik River valley 8 km to the west of the Itikmalak River. Northern harrier sightings have been recorded for the North Fork Koyukuk River and, thus harriers are very likely to be found along the Middle Fork as well.

Raptor Nest Density

The Killik River had the lowest raptor diversity, but more nest sites were located there than on other survey areas. Eighty-eight percent of the golden eagle nests observed on the Killik River were inactive in 1991, and a similar survey completed in 1988 found 81% of the nests to be inactive (Garber 1988). The 5 active golden eagle nests located by Garber in 1988 were all inactive in 1991. Given the high percentage of inactive nests, it may be that only a limited golden eagle density can be supported in the area and birds shift between nest sites from year to year.

The Noatak and the Kobuk rivers had the highest number of active raptor nests with 7 and 6 respectively. Fewer nests were found on the Alatna River than on other surveyed rivers (Tables 2 and 3), but this is twice the number of nests located in the area by Price (1985), who located 3 inactive nests. This increase in observed nests potentially indicates a slight increase in raptor populations in that area if search efforts were comparable.

Factors Influencing Raptor Survey Results

Sightability of nests and raptors were influenced by weather, search effort, group size, time constraints, survey method (foot or boat), and seasonal timing of survey. Rainy weather reduced visibility and search effort on the Kobuk and Middle Fork Koyukuk surveys. The Middle Fork Koyukuk survey was essentially washed out by flash flooding, which required all attention be focused on canoe navigation and tree avoidance. Search effort was enhanced by the larger group sizes on the Noatak and Kobuk River surveys. Larger groups increased the

likelihood that a raptor in the area would be detected and enabled more territory to be surveyed by splitting into smaller groups.

All river surveys were hampered by time constraints, and little ground searching and nest observation could be conducted given the river distance to be covered. Several "inactive" nests on the Killik and Noatak rivers may have contained nestlings, but the several hours of observation which are often required to detect small nestlings or observe parent birds returning to the nest were not available. The peregrine nests on the Middle Fork Koyukuk and Itikmalak Rivers each required approximately 1.5 hours of observation before the adult birds flew to the nest or nestlings were observed. Foot travel on the Itikmalak survey allowed more time per unit area covered for raptor detection and nest observation, but limited the size of the area surveyed.

Seasonal timing is critical to bird observations at nest sites. If the survey is conducted too early, adult birds are sitting motionless on the nest and may not vocalize. If the survey is conducted too late in the season, nestlings may have fledged and left the nest site. Additionally, nesting and territory defense intervals vary in length and time of year between species. Gyrfalcons and great horned owls nest and fledge much earlier than other raptors and may not defend the nest site after this time. The surveys on the Alatna and Killik rivers were probably conducted too late in the season to detect active nests through territorial defense displays and frequent nest visits. On the other hand, ospreys on the Kobuk River apparently were still brooding and nestlings were either too small or too inactive to be seen by observers. Osprey nestlings have been known to fledge as much as 1 month later than bald eagle nestlings (K. Kozie, Natl. park Serv., pers. commun.).

The number of nests located on rivers that previously had been surveyed was higher than for those being surveyed for the first time. In areas being surveyed for the first time, nests are generally detected when they are active and adult birds are aggressively defending the nest area, which produces a bias towards active nests and against inactive nests. More inactive nests were reported for the Killik and Noatak rivers because nests located during a 1988 Killik River survey (Garber 1988) and from Noatak National Preserve's past nest records were relocated, often in areas that otherwise might not have been searched.

Potential Human Disturbance

Aircraft overflights and recreational boating activity probably present the major sources of human disturbance to nesting raptors in the park and preserve. The Alatna and Noatak rivers were particularly subjected to aircraft overflights due to the popularity of the Noatak River for float trips. Most

aircraft flights out of Bettles fly up the Alatna valley to reach the Noatak drainage. Airplane activity in the Alatna valley was high during the survey and averaged 6 flights per day.

Ospreys on the Kobuk River were highly disturbed by human activity. Brooding birds left the nest and began circling and vocalizing when observers in boats came within 150 m of the nest site. Since ospreys selected large live spruce trees along riverbanks for nests, harvest of house logs for subsistence use along the Kobuk River could remove and restrict the number of suitable osprey nest trees. Additional disturbance will occur if the transportation corridor provided for by ANILCA is constructed from the Dalton highway to the Ambler Mining District through the Kobuk Preserve Unit. The proposed route for this road parallels the Kobuk River and the effects of road-building activities and increased visitor access to the Kobuk River upon completion of this road could heavily impact osprey populations in the area.

Oil, gas, and mineral exploration and associated development poses a problem to nesting raptors in the Killik and Itikmalak river areas. Helicopter use can frighten adult birds off of eggs or vulnerable nestlings and also may cause nestlings to fledge prematurely. Minimal helicopter use should occur during early nesting periods. Mining development along the Middle Fork Koyukuk River, especially near Tramway Bar, could threaten nesting peregrines in the area through habitat destruction and noise/human disturbance.

Anticipated increases in visitor use of the Itikmalak, Middle Fork Koyukuk, and Noatak river areas could be detrimental to nesting raptors through increased human disturbance. With the opening of the Dalton Highway to public use, increases in recreational hiking, boating, and hunting activity within the Itkillik Preserve (which includes the Itikmalak River) and along the Middle Fork Koyukuk River are anticipated due to ease of access from the road. Recreational development by the Bureau of Land Management along the Dalton Highway will allow more visitors to access the east side of the park and preserve, and if horse corrals are established at Galbraith Lake as planned, visitor access to the Itkillik Preserve will be greatly enhanced. The ease of starting a trip on the Middle Fork Koyukuk River and floating into Bettles will also appeal to visitors traveling up the Dalton Highway.

The Noatak River continues to be a popular destination for river rafting and visitation has been high. Currently there is little evidence that raptor populations are being influenced by increased human disturbance in the area, but nesting areas within the park are relatively far from the river's edge where human activity is generally focused. Increased human disturbance is more likely to affect nesting raptors in the Noatak Preserve, where raptors are nesting on cutbanks along the river.

CONCLUSIONS

A routine monitoring program for raptors in the park and preserve should be implemented to assess visitor impacts on nesting raptors and the general health of the raptor population. The monitoring plan should follow guidelines established in the 1990 Raptor Management Plan for Gates of the Arctic National Park and Preserve (Appendix III). Based on 1991 survey results, the Noatak and Kobuk Rivers should be monitored for species diversity. However, since Noatak National Preserve has been monitoring the Noatak River raptor nests for several years, it would be in the park's best interest to continue allowing them to monitor the Noatak and choose another northern river, such as the Killik or Itkillik River, to monitor in addition to the Kobuk River. Assistance to Noatak Preserve staff conducting the survey should be provided by the park and preserve if requested. A survey of the North Fork Koyukuk River should be conducted to determine raptor populations in that area, especially with the increased recreational boating activity the area appears to be receiving. Park resource management staff should anticipate the effects of increased public visitation on raptor populations in the eastern part of the park and preserve and carefully monitor raptor populations in these areas.

Surveys should be conducted between mid-June and early July to more easily locate active nests and observe nestlings. The 1991 surveys on the Alatna and Killik Rivers were probably conducted too late in the season, giving low species abundance and diversity estimates. Surveys on the Kobuk River should be conducted in early to mid July to increase the likelihood of counting osprey nestlings. Osprey nests were so deep that seeing nestlings was nearly impossible and aircraft overflights or a later survey may be required in late July to count nestlings and/or fledglings. Survey time lengths should also be increased beyond 10 days to allow more time to search for nests in side canyons and tributaries.

Human disturbance should be minimized in areas with nesting raptors. Helicopter use during June and July should be limited to decrease nest disturbance and care should be taken to avoid scaring adult birds off the nest (possibly causing ejection of eggs or nestlings from the nest) or causing premature fledging of nestlings. Restrictions on helicopter proximity to nesting cliffs during nesting season should be considered. Educational programs concerning disturbance of raptor nesting areas could be conducted for park visitors in early summer to increase their awareness of raptor disturbance.

Raptor populations may serve as indicators of the wilderness qualities of the park and preserve. By monitoring the health and productivity of raptor populations, resource managers may be able to detect changes resulting from increased human use and disturbance of wilderness areas and make management decisions to minimize these impacts and maintain healthy raptor populations.

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APPENDIX A. Detailed descriptions of raptor observations recorded during raptor surveys on the Alatna, Itikmalak, Kiilik, Kobuk, Middle Fork of the Koyukuk, and Noatak Rivers, Gates of the Arctic National Park and Preserve, Brooks Range, Alaska, June-July 1991.

Table A1. Raptor observations along the Alatna River, Gates of the Arctic National Park and Preserve, Alaska, 23-30 July 1991.

Species	Date	Observation/Location
Northern harrier		
	23 July	Adult male hunting on the east side of the Alatna. Flight pattern 10 m above the ground. 2.4 km south of the mouth of Arrigetch creek. 67° 30'N latitude, 153° 55'W longitude.
	27 July	Adult female hunting along a small pond near the mouth of the Takahula River. 67° 19'N latitude, 153° 34'W longitude.
	29 July	Adult female hunting 7.5 km upstream from the mouth of the Malamute Fork of the Alatna. 67° 30'N latitude, 153° 21'W longitude.
Harlan's hawk		
	29 July	Solitary adult seen perched in tree and flying circles above the raft. Dark morph with unbanded tail except for a thin terminal band. 11 km upstream from the mouth of the Malamute fork of the Alatna. Outside park boundaries. 67° 05'N latitude, 153° 19'W longitude.
	30 July	Solitary adult first seen perched, then flying and vocalizing. Dark morph with white streaking on breast. 4 km upstream from the mouth of the Malamute Fork of the Alatna. Outside park boundaries. 67° 02'N latitude, 153° 17'W longitude.
	30 July	Two dark-phase Harlan's hawks acting defensive but no nest found. Outside park boundary. 67° 00'N latitude, 153° 24'W longitude.
Golden eagle		
	25 July	Immature soaring high over meadows east of the river. White rump patch obvious. 4.9 km downriver from the mouth of Pingaluk River. 67° 26'N latitude, 153° 44'W longitude.

Table A1. (continued)

Species	Date	Observation/Location
Peregrine falcon		
	28 July	1 adult and 1 fledgling observed flying and vocalizing. Eyrie was a ledge 1.5 - 2.5 m long with lots of whitewash on the edge. Takahula lake. 67° 21'N latitude, 153° 40'W longitude.
American kestrel		
	27 July	2 adults observed perched in tree top, flying and being very vocal. Female was more rufous and larger than the male and may have been a subadult because the male was feeding it. 67= 20'N latitude, 153° 34'W longitude.
Great horned owl		
	29 July	1 adult flew out of tree and along the river bank, flying low. Outside park boundary. 9 km upstream from the mouth of the Malamute fork of the Alatna. 67° 04'N latitude, 153° 19'W longitude.

Table A2. Raptor observations in the Itikmalak River area, Gates of the Arctic National Park and Preserve, Alaska, 16-24 June 1991.

Species	Date	Observation/Location
Rough-legged Hawk		
	20 June	2 adult birds actively defending a hanging canyon in the valley west of the Itikmalak River. Probable nest site in the canyon but too difficult to access. Birds were diving at observers and flaring their wing patches at the end of a dive. One observed hunting voles on the tundra earlier in the day. 68° 25'N latitude, 149° 47'W longitude.
	22 June	2 adult birds vocalizing and defending a nest site. One bird went to the nest and appeared to be brooding but no nestlings seen. Outside preserve boundary 68° 24'N latitude, 149° 36'W longitude.
	22 June	1 adult bird being dive-bombed by a peregrine falcon. Bird was rolling in midair to use its talons to fend off the falcon. Galbraith lake area. Outside preserve boundary. 68° 28'N latitude, 149° 32'W longitude.
Golden Eagle		
	16 June	1 adult soaring along the cliff face. No nest site located. 68° 26'N latitude, 149° 42'W longitude.
	18 June	3 subadults flying down the Itikmalak valley and soaring on thermals. 68° 22'N latitude, 149° 41'W longitude.
Gyrfalcon		
	18 June	2 adults, both dark morphs, soaring on thermals. 68° 26'N latitude, 149° 43'W longitude.

Table A2. (continued)

Species	Date	Observation/Location
Peregrine Falcon		
	20 June	2 adults flying, vocalizing, and feeding 2 nestlings (<7 days old) at a nest site. Female fed a ground squirrel to the white, downy nestlings and male disappeared. Itikmalak valley,. 68° 21'N latitude, 149° 42'W longitude.
	22 June	1 adult dive-bombing a rough-legged hawk. Later observed it perched on cliffs east of Galbraith lake, vocalizing and acting territorial. Potential nest site. Outside preserve boundary. 68° 28'N latitude, 149° 32'W longitude.

Table A3. Raptor observations along the Killik River, Gates of the Arctic National Park and Preserve, Alaska, 22-31 July 1991.

Species	Date	Observation/Location
Northern Harrier		
	22 July	1 adult female flying low to investigate camp. Northwest end of Tulilik Lake near Easter Creek and Killik River confluence. 68° 07'N latitude, 154° 07'W latitude.
	23 July	1 adult female hunting. 3 unsuccessful attempts to capture prey observed. Tulilik Lake. 68° 06'N latitude, 154° 07'W longitude.
	25 July	1 female hunting at 1-5 m off the ground heading south. West side of Killik River, 2 drainages south of Lake Kaniksrak. 68° 10'N latitude, 154° 11'W longitude.
Golden Eagle		
	23 July	1 adult soaring over ridge. 2.5 km northeast of Tulilik Lake near confluence of Easter Creek and Killik River. 68° 08'N latitude, 154° 05'W longitude.
	25 July	1 adult soaring. Lake Kaniksrak. 68° 13'N latitude, 154° 12'W longitude.
	26 July	1 adult male soaring near a nest site. West side of Killik River by Irivik Creek. 68° 13'N latitude, 154° 09'W longitude.
	26 July	1 nestling at a nest site. Nestling had solid black wings, white on chest with black line around brown body. Patch of white on forehead and scattered white in wings. 10% down remaining. Irivik Creek. 68° 13'N latitude, 154° 09'W longitude.
	27 July	1 adult soaring close to cliffside. 68° 15'N latitude, 154° 00'W longitude.
	27 July	1 immature (probably a female) perched on small sand dunes near the mouth of Aniakvik Creek. Being harassed by terns. 68° 16'N latitude, 154° 04'W longitude.

Table A3. (continued)

Species	Date	Observation/Location
Golden Eagles (continued)		
	27 July	1 adult male and 1 immature female. Birds circling on thermals. 0.5 km south of Ivisak Creek. 68° 19'N latitude, 154° 04'W longitude.
	28 July	1 adult flew at observers, "hovered" briefly, then flew off over a ridge. 68° 21'N latitude, 154° 07'W longitude.
	29 July	1 nestling, 45-60 days old. 68° 20'N latitude, 154° 58'W longitude.
Merlin		
	24 July	1 adult female vocalizing and exhibiting defensive behavior. No young or nest seen, though probably close by. 68° 08'N latitude, 154° 17'W longitude.

Table A4. Raptor observations along the Kobuk River, Gates of the Arctic National Park and Preserve, Alaska, 9-16 July 1991.

Species	Date	Observation/Location
Goshawk		
	11 July	Adult flushed from a tree perch. 1.6 km downstream from the mouth of Walker Lake outlet. 67° 02'N latitude, 154° 21'W longitude.
Northern harrier		
	11 July	Adult female flying. 5.7 km downstream from the Walker Lake outlet. 67° 00'N latitude, 154° 23'W longitude.
	16 July	Gray adult male hunting over willow shrub habitat. 66° 02'N latitude, 156° 03'W longitude.
Rough-legged Hawk		
	14 July	Perched adult exhibiting territorial behavior. No nest observed. 8.2 km downstream from mouth of Beaver Creek. 66° 47'N latitude, 155° 08'W longitude.
	13 July	Juvenile hawk observed perched and flying. 1.2 km upstream from the Lower Kobuk Canyon. 66° 50'N latitude, 154° 39'W longitude.
	13 July	Adult exhibiting territorial defense with loud vocalizations and circling flight pattern, but no nest was found. Wildfire has burned trees on the eastern shore in past few days so may have lost nest. 0.8 km below the Lower Kobuk Canyon. 66° 48'N latitude, 154° 43'W longitude.
Harlan's Hawk (Red-tailed Hawk)		
	12 July	Very vocal adult observed both perched and flying. Exhibiting territorial defense behavior. 16.3 km downstream from the Upper Kobuk Canyon. 66° 54'N latitude, 154° 37'W longitude.

Table A4. (continued)

Species	Date	Observation/Location
	15 July	2 adults and 1 80% feathered nestling at a nest site. Nestling was close to adult size and had downy feathers on head and scattered over the body, especially around the eyes and beak. Adults were flying and screeching. 2.5 km downstream from the mouth of Sulakpoatakvik Creek. 66° 46'N latitude, 155° 15'W longitude.
Bald Eagle		
	15 July	Adult in flight. 1.2 km downstream from mouth of Akpelik Creek. 66° 45'N latitude, 155° 24'W longitude.
	15 July	Adult in flight. 8 km downstream from the mouth of Akpelik Creek. 66° 46'N latitude, 155° 30'W longitude.
	16 July	Adult seen perched in tree but flew off at our approach. 4 km upstream from the mouth of the Selby River. 66° 46'N latitude, 155° 43'W longitude.
Osprey		
	09 July	Adult bird flying upriver below the rapids in the Walker Lake outlet. Also seen 11 July by another part of our group. 67° 03'N latitude, 154° 18'W longitude.
	11 July	2 adults at a sticknest. 1 bird was brooding and the other perched until disturbed by the boats. Adults were missing primary feathers. No nestlings were observed. 4 km upstream from the Upper Kobuk Canyon. 66° 58'N latitude, 154° 22'W longitude.
	11 July	1 adult flying. 5.7 km downstream from the mouth of the Walker Lake outlet. 67° 00'N latitude, 154° 23'W longitude.
	12 July	2 adults at a sticknest. 1 adult brooding, the other perched until disturbed by the boats. No nestlings observed. 3.3 km south of the Upper Kobuk Canyon. 66° 58'N latitude, 154° 25'W longitude.

Table A4. (continued)

Species	Date	Observation/Location
	12 July	2 adults at a sticknest. 1 adult brooding, the other perched until disturbed by the boats. No nestlings observed. 66° 52'N latitude, 154° 38'W longitude.
	13 July	2 adults at a sticknest. 1 adult brooding and the other both perched and flying nearby. Greatly agitated by our presence. Lower Kobuk Canyon. 66° 49'N latitude, 154° 40'W longitude.
	13 July	1 brooding adult at a sticknest. 0.8 km downstream of the Lower Kobuk Canyon. 66° 48'N latitude, 154° 43'W longitude.
	15 July	1 adult perched and then flying when disturbed. Bear Island. 66° 45'N latitude, 155° 19'W longitude.
Peregrine Falcon		
	13 July	1 adult flew to an abandoned sticknest and perched briefly before flying off. Continental phase markings. Lower Kobuk Canyon. 66° 49'N latitude, 154° 41'W longitude.
Great Horned Owl		
	11 July	1 adult flew across the river and landed in a spruce tree. 1.2 km south of the mouth of the Walker Lake outlet. 67° 01'N latitude, 154° 20'W longitude.
Short-eared Owl		
	11 July	1 adult flew across the river. 5.7 km downstream from the mouth of the Walker Lake outlet. 67° 00'N latitude, 154° 23'W longitude.

Table A5. Raptor observations along the Middle Fork of the Koyukuk River, Gates of the Arctic National Park and Preserve, Alaska, 25-27 June 1991.

Species	Date	Observation/Location
Peregrine Falcon		
	26 June	2 adult birds at a nest site. Birds were seen perched, flying, preening, and flying into nest area. Nest not seen due to heavy vegetation. Both appeared to be the "continental" variety with full helmet and wide mustache marks. 67° 04'N latitude, 150° 39'W longitude.
Great Horned Owl		
	26 June	1 adult seen perched and flying. Horns and coloration definitive. 67° 03'N latitude, 150° 48'W longitude.

Table A6. Raptor observations along the Noatak River, Gates of the Arctic National Park and Preserve, Alaska, 10-22 June 1991.

Species	Date	Observation/Location
Northern Harrier		
	14 June	1 adult hunting. Kugrak River. 67° 39'N latitude, 155° 37'W longitude.
	17 June	1 adult flying low and slow hunting. Ipnelivik River. 67° 41'N latitude, 156° 10'W longitude.
	18 June	1 adult soaring high over the Noatak River. Tunukchiak Creek. 67° 52'N latitude, 156° 30'W longitude.
Rough-legged hawk		
	17 June	2 adult birds at a nest site. Birds were vocalizing, flying overhead, and sometimes perched. One bird, presumably the female, sat on the nest for awhile in incubating posture--probably still on eggs. Cliffs west of Matcharak Lake along Nushralutak Creek. 67° 45'N latitude, 156° 20'W longitude.
Golden eagle		
	13 June	1 adult observed in territorial defense. Did not land in observed nests in the area and no activity at these nests was observed. Unnamed creek east of Anorat Creek. 67° 40'N latitude, 155° 27'W longitude.
	13 June	1 adult seen both perched and flying and 2 nestlings approximately 2 weeks old. Sticknest on cliff. Pingo Lake area. 67° 41'N latitude, 156° 22'W longitude.
	18 June	1 adult perched on edge of a sticknest and facing 2 nestlings approximately 2 weeks old. 5 km downriver from the mouth of Douglas Creek. Outside park boundaries. 67° 52'N latitude, 156° 38'W longitude.

Table A6. (continued)

Species	Date	Observation/Location
Gyrfalcon		
	13 June	1 gray-phase adult flew in to nest site with prey item, possibly a vole as a thin tail was seen hanging from the talon. Heard young calling when adult arrived at the nest. Adult then perched near the nest after feeding the nestlings. Nestlings were not seen. Otkurak Creek area. 67° 40'N latitude, 155° 21'W longitude.
	17 June	1 gray-phase female brooding at the nest. Flushed when disturbed, but remained in the area and did not vocalize or mob the observers. Only 1 downy chick was visible, but could not see into the nest. Brown-phase male seen prior to finding the nest. Cliffs west of Matcharak Lake along Nushralutak Creek. 67° 46'N latitude, 156° 20'W longitude.
Peregrine Falcon		
	15 June	1 adult flushed from the nest when observers arrived. No mobbing or vocalizing. 3 downy chicks were observed and appeared to be about 1 week old since they had trouble holding their heads up.
Merlin		
	10 June	1 adult perched in a tree. 12-mile slough. 67° 37'N latitude, 155° 14'W longitude.
	13 June	1 adult female (?) being mobbed by a robin. Drainage above Pingo Lake. 67° 40'N latitude, 155° 22'W longitude.
Short-eared Owl		
	18 June	1 adult flying low and slow over the river, probably hunting. Tunukchiak Creek. 67° 52'N latitude, 156° 30'W longitude.
	16 June	1 adult flying low and hunting. Ipnelivik Creek. 67° 41'N latitude, 156° 10'W longitude.

APPENDIX B. Detailed descriptions of raptor nest sites located during raptor surveys on the Alatna, Itikmalak, Kiilik, Kobuk, Middle Fork of the Koyukuk, and Noatak Rivers, Gates of the Arctic National Park and Preserve, Brooks Range, Alaska, June-July 1991.

Table B1. Raptor nest sites along the Alatna River, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 23-30 July 1991.

Golden eagle

Location: Mouth of Pingaluk River. 67° 28'N latitude, 153° 46'W longitude.
Nest Status: inactive GAAR Nest location code: 29-100-02,03-91
Nest Description: Sticknest on cliff with eastern exposure. Nest was in good condition though not used in 1991. Possibly used early in the season by gyrfalcons. Nest was inaccessible to ground predators. Elevation: 300 m.

Location: 5 km S of Takahula Lake. 67° 21'N latitude, 153° 31'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-079-01-91
Nest Description: Large sticknest on limestone cliff 120 m high and 1 km long. Nest had a southern exposure. Nest was 1.2 m wide by 0.6 m deep and in good condition. Faint whitewash below the nest. Boating activity on the river 0.03 km away was visible from the nest. Elevation: 380 m.

Peregrine Falcon

Location: Takahula Lake. 67° 21'N latitude, 153° 40'W longitude.
Nest Status: active GAAR Nest Location Code: 29-005-01-91
Nest Description: Ground nest on cliff ledge. Nest height was 35 m on a 70 m cliff with a southeast exposure. Lots of whitewash on ledge. Elevation: 320 m.

Unidentified Raptor

Location: Alatna River near Circle Lake. 67° 30'N latitude, 153° 52'W longitude.
Nest Status: active GAAR Nest Location Code: 29-009-01-91
Nest Description: Sticknest on cliff 2 km from the river. At least 1 nestling. Nest in good condition and facing southwest. Boating and aircraft activity visible from the nest. Nest observed from 6 km so few details available. Elevation: 380 m.

Location: Alatna River near Circle Lake. 67° 31'N latitude, 153° 53'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-008-01-91
Nest Description: Ground nest on cliff ledge. Nest in good condition with southwest exposure. Whitewash on cliff below the ledge. Elevation: 550 m.

Table B1. (continued)

Common Raven

Location: 14.7 km upstream from the mouth of the Malamute Fork of the Alatna River. 67° 05'N latitude, 153° 21'W longitude.
Nest Status: active GAAR Nest Location Code: 29-014-01-91
Nest Description: Sticknest on cutbank cliff 10 m in height. Perch below the nest has whitewash. No young in nest when observed but whitewash and nest condition indicated use in 1991.
Elevation: 240 m.

Table B2. Raptor nest sites in the Itikmalak River Area, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 16-24 June 1991.

Rough-legged Hawk

Location: Valley west of the Itikmalak River valley. 68° 23'N latitude, 149° 47'W longitude.
Nest Status: active GAAR Nest Location Code: 23-121-01-91
Nest Description: Could not find the nest due to difficulty of climbing and agitation of the birds. Nest was located in side hanging canyon.

Location: East of Itikmalak valley. 68° 25'N latitude, 149° 36'W longitude.
Nest Status: active GAAR Nest Location Code: 23-120-01-91
Nest Description: Sticknest on ledge with no overhead ledge for sun protection. Nest faces east and was in good condition.
Elevation: 1311 meters.

Golden Eagle

Location: Cliffs on north side of Itikmalak River where it turns and flows west. 68° 26'N latitude, 149° 43'W longitude.
Nest Status: inactive GAAR Nest Location Code: 23-127-01-91
Nest Description: Sticknest on cliff of Lisburne limestone. Cliff 30 m high and 0.03 km long. Nest in good condition and faced southeast. Elevation: 945 m.

Peregrine Falcon

Location: Itikmalak River valley. 68° 21'N latitude, 149° 42'W longitude
Nest Status: active GAAR Nest Location Code: 23-005-01-91
Nest Description: Ground nest on limestone cliff ledge. Cliff was 50 m in height and 0.075 km in length. Nest faced west and was 20 m from the base of the cliff. Lots of whitewash at the nest site and long streaks below the nest. Several perches on surrounding rocks. Eyrie was only 15-20 cm tall--adult bird had to hunch to stand next to the nestlings. Nest completely inaccessible to ground predators and researchers. Elevation: 1128 m.

Unidentified Raptor

Location: South side of Itikmalak River. 68° 25'N latitude, 149° 43'W longitude.
Nest Status: inactive GAAR Nest Location Code: 23-007-01-91
Nest Description: Abandoned sticknest with orange lichen on limestone cliff below. Cliff Height was 50 m and length was 2 km. Nest faced north and was in poor condition. Moderate difficulty for ground predators to reach the nest. Elevation: 1036 m.

Table B2. (continued)

Location: River valley west of the Itikmalak valley. 68° 22'N latitude, 149° 48'W longitude.
Nest Status: inactive GAAR Nest Location Code: 23-012-01-91
Nest Description: Abandoned sticknest on limestone cliff. Cliff height was 30 m and cliff length was 0.05 km. Nest faced east and was 15 m from the base of the cliff. Nest was in good condition and ground accessibility was difficult. Elevation: 1158 m.

Common Raven

Location: East side Itikmalak valley. 68° 21'N latitude, 149° 42'W longitude.
Nest Status: active GAAR Nest Location Code: 23-013-01-91
Nest Description: Sticknest on limestone cliff. Cliff was 50 m in height and 0.075 km in length; nest was 40 m from the base of the cliff. Nest was in good condition with lots of whitewash on and near the nest. The nest was situated only 20 m above an active peregrine falcon nest. Accessibility was very difficult from the ground. Elevation: 1143 m.

Table B3. Raptor nest sites along the Killik River, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 22-31 July 1991.

Golden Eagle

Location: Confluence of the Killik River and Easter Creek. 68° 08'N latitude, 154° 06'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-033-01,02-91
Nest Description: 2 sticknests on southwest facing cliffs. Cliff is 60 m high and 0.5 km long. Nest site is 25 m from the base. Upper nest is in good condition, but lower one is poor. Nests are protected by an overhang 1 m above the upper nest. Very little whitewash near the nests. Elevation: 860 m.

Location: Confluence of the Killik River and Easter Creek. 68° 08'N latitude, 154° 05'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-032-01-91
Nest Description: Sticknest on southwest facing cliffs. Cliff was 0.5 km long and nest was 15 m from the base of the cliff. Nest accessibility was easy. Nest condition was poor. Well-developed whitewash streak near nest site and at perch site 75 m east of the nest site. No young seen at the nest. Elevation: 860 m.

Location: Confluence of Sugakuik Creek and the Killik River. 68° 08'N latitude, 154° 16'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-026-01-91
Nest Description: Sticknest on far end of cliff face. Cliff formed of crumbling sedimentary rock (slate) and was 600 m high by 0.33 km long. Nest was 200 m from the base of the cliff and faced northeast. Nest condition was good and accessibility was moderately difficult. Area of white lichens or whitewash located directly above the nest. No new layers of sticks or vegetation present. Elevation: 900 m.

Location: Confluence of Sugakuik Creek and the Killik River. 68° 08'N latitude, 154° 16'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-027-01-91
Nest Description: Remnant sticknest on small outcrop of southeast facing slope. Cliff was 25 m in height and 0.04 km in length. Nest was located 15 m from the base of the cliff and was easily accessible from the ground. Old area of whitewash on the cliff near the nest--may still be used as a roost. Elevation: 780 m.

Table B3. (continued)

Location: 3 drainages downriver from Sugakuik Creek/Killik River confluence. 68° 10'N latitude, 154° 13'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-031-01,02-91
Nest Description: 2 inactive sticknests on sedimentary cliff 70 m in height and 0.04 km in length. Nests were 40 m from the base of the cliff on the northside of a small stream. Cliff face surrounding the nest was orange with lichens. Accessibility was very difficult. Nests were in good condition and surrounded by several roosting sites with whitewash underneath. Elevation: 930 m.

Location: 2 drainages upstream from Lake Kaniksrak. 68° 11'N latitude, 154° 12'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-030-01-91
Nest Description: Sticknest on sedimentary cliff 50 m in height and 0.20 km long. Nest was located 25 m above the base of the cliff and faced southeast. Nest in poor condition and no whitewash was seen near the nest. Nest protected by overhang 1-2 m above the nest. Was active in 1988. Elevation: 780 m.

Location: South side of Irivik Creek at the confluence with the Killik River. 68° 13'N latitude, 154° 09'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-037-01,02-91
Nest Description: 2 sticknests in good condition. Top nest was older and protected by an overhang. Lower nest was in "amphitheater-type" rock setting with moss and fresh greens in the nest. Lower nest had 10 m whitewash streak below it but it looked old. 2 roosts located near the nests. Both nests measured approximately 1.5 m x 3.0 m. Elevation: 700 m.

Location: Irivik Creek. 68° 13'N latitude, 154° 09'W longitude.
Nest Status: active GAAR Nest Location Code: 21-036-01-91
Nest Description: Sticknest on sedimentary cliff 70 m high and 0.5 km long. Nest was 65 m from the base of the cliff and faces southwest. Protected by an overhang and sidewalls. Nest measured 2 m in diameter and 0.5 m deep. Moss, sticks, and fresh birch greens associated with the nest structure. Solitary nestling had solid black wings, white on chest with black line around the brown body. White feathers scattered on wings and approximately 10% downy feathers remained. Accessibility was easy. Elevation: 690 m.

Location: Irivik Creek. 68° 13'N latitude, 154° 09'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-036-02-91
Nest Description: Sticknest on sedimentary cliff 70 m high and 0.5 km long. Nest was 50 m from the base of the cliff and faced southwest. Nest was 2 m in diameter and 0.7 m thick and completely covered the ledge. Layer of fresh sticks existed on the nest. Elevation: 700 m.

Table B3. (continued)

Location: Killik River. 68° 14'N latitude, 154° 00'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-041-01-91
Nest Description: Sticknest on cliff outcrop 60 m high and 3.2 km long. Nest located 10 m from the base of the cliff. Nest faced south to southwest and was very difficult to access. No overhang and minimal sidewalls for nest protection. No whitewash apparent at nest site, but roost with whitewash existed to the south. Nest had apparently been inactive for several years as a shrub was growing out of the nest and older sticks were falling down the side of the nest. Elevation: 950 m.

Location: 68° 21'N latitude, 154° 08'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-050-01-91
Nest Description: Sticknest on sedimentary cliff 70 m high and 0.2 km long. Nest located 15 m from the base of the cliff and faced south. Nest located below a very dark section of cliff; orange lichen and greenery observed around the nest. Nest measured 3 m x 1.5 m and was 0.5 m thick and was in poor condition and falling apart. No whitewash observed near the nest. Easily accessible from the ground. Elevation: 1050 m.

Location: 68°20'N latitude, 154° 58'W longitude.
Nest Status: active GAAR Nest Location Code: 21-045-01,02-91
Nest Description: Sticknest on sedimentary cliff face 30 m high and 0.1 km long. Active nest was 15 m from the base of the cliff and faces southwest. Lower nest was remnant and easily accessed. Top nest was moderately difficult to access. 2 heavily whitewashed roosts near the nest sites. Active nest was 2 m in diameter and 2 m thick and was protected by some overhanging rock and a sidewall to the north. Lower nest was on a narrow ledge and measured 3 m long, 1.5 m wide, and 0.5 m thick. 1 nestling was in the upper nest and was defending the nest with spread wings and wheezy vocalizations.
Elevation: 780 m.

Location: 68° 21'N latitude, 154° 57'W longitude.
Nest Status: inactive GAAR Nest Location Code: 21-046-01-91
Nest Description: Sticknest on sedimentary cliff face 75 m high and 0.02 km long. Nest was 60 m from the base of the cliff and faced south-southeast. Accessibility was very difficult. Obvious orange lichen near nest site. 2 prominent roosts located just west of the nest site. Elevation: 945 m.

Table B3. (continued)

Gyrfalcon

Location: 68° 20'N latitude, 153° 57'W longitude.
Nest Status: active GAAR Nest Location Code: 21-006-01-91
Nest Description: Sticknest on sedimentary cliff 100 m high and 0.1 km long. Nest was 30 m above the creek and faced north-northeast. Nest was in good condition and appeared to have been used this year. Nest was 1.2 m in diameter and 0.5 m thick (appeared to be an old golden eagle nest). Sticks and prey remains under the nest. Nest and perches on cliff face have been heavily whitewashed. Top of nest looked hardened with mud and was small and cup-shaped. Nest was protected by sidewalls and overhang. Elevation: 700 m.

Table B4. Raptor nest sites along the Kobuk River, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 09-16 July 1991.

Harlan's Hawk (Red-tailed Hawk)

Location: 2.5 km downstream from the mouth of Sulakpoatokvik Creek. 66° 45'N latitude, 155° 16'W longitude.
Nest Status: active GAAR Nest Location Code: 38-004-01-91
Nest Description: Sticknest in live spruce tree approximately 20 m in height and 38-40 cm DBH. Nest was in good condition and was approximately 1 m by 0.5 m. Nest had green alder leaves mixed in with twigs. No kill remains or dead young under the nest. Single nestling, 80% feathered and adult size.

Osprey

Location: 4 km upstream from the Upper Kobuk Canyon. 66° 58'N latitude, 154° 22'W longitude.
Nest Status: active GAAR Nest Location Code: 38-019-01-91
Nest Description: Sticknest in live spruce 5 m in height and 27.5 cm DBH. Several old nests had blown down under the tree. Nest was in good condition and approximately 1 m deep and 1.5 m in diameter. Brooding bird left the nest when we approached by boat to within 50 m. 2 adults present, but no nestlings were heard or seen.

Location: 3.3 km downstream from the Upper Kobuk Canyon. 66° 58'N latitude, 154° 25'W longitude.
Nest Status: active GAAR Nest Location Code: 38-018-01-91
Nest Description: Sticknest in live spruce 30 m in height and 11 cm DBH. Eyrie was approximately 1.6 m deep. 2 adults present, but no nestlings were heard or seen. Birds were easily disturbed.

Location: 66° 53'N latitude, 154° 38'W longitude.
Nest Status: active GAAR Nest Location Code: 38-017-01-91
Nest Description: Sticknest in live spruce 11 m in height and 30 cm DBH. Nest was in good condition and was 1.5 m deep and approximately 1.5 m in diameter. 2 adults were present, but no nestlings were heard or seen. Birds were easily disturbed.

Location: Lower Kobuk Canyon. 66° 49'N latitude, 154° 40'W longitude.
Nest Status: active GAAR Nest Location Code: 38-016-01-91
Nest Description: Sticknest in dead birch tree leaning out at a 45° angle from the cliff face. Nest tree was 6 m tall and 26 cm DBH. Nest was in good condition although in a somewhat precarious perch. Both adults were present, but no nestlings were heard or seen. Birds were easily disturbed.

Table B4. (continued).

Location: 0.8 km downstream from the Lower Kobuk Canyon. 66° 48'N latitude, 154° 43'W longitude.
Nest Status: active GAAR Nest Location Code: 38-020-01-91
Nest Description: Sticknest in dying spruce tree 13 m in height and 30 cm DBH. Nest was 0.8 m deep and 0.8 m in diameter. 1 adult seen but no nestlings.

Unidentified Raptor

Location: 2.5 km upstream from the Lower Kobuk Canyon. 66° 51'N latitude, 154° 38'W longitude.
Nest Status: inactive GAAR Nest Location Code: 38-008-01-91
Nest Description: Very small sticknest with whitewash on the sticks. Live tree was 18.3 m tall and 41 cm DBH. Nest was 0.5 m in diameter and 0.2 m deep. 4 pellets found under the nest contained fish scales, feathers, and Microtus spp. skeletal material. Appears that this nest was active this season--either an early or failed nest. Possibly a great horned owl.

Location: Lower Kobuk Canyon. 66° 49'N latitude, 154° 41'W longitude.
Nest Status: inactive GAAR Nest Location Code: 38-009-01-91
Nest Description: Large sticknest on sedimentary rock outcrop on steep shale slope. Nest was in poor condition and faced southwest. Sticks were strewn about on the slope below the nest. A peregrine falcon landed on it while we were observing it.

Location: Island just upstream from the mouth of Sulakpoatakvik Creek. 66° 46'N latitude, 155° 13'W longitude.
Nest Status: inactive GAAR Nest Location Code: 38-007-01-91
Nest Description: Sticknest located in 15 m live tree. Nest was 0.5 m thick and 0.6 m in diameter.

Table B5. Raptor nest sites along the Middle Fork of the Koyukuk River, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 25-27 June 1991.

Peregrine Falcon

Location: Southwest of Tramway bar on the southern cliffs of the Middle Fork of the Koyukuk. 67^0 04'N latitude, 150^0 39'W longitude.
Nest Status: active GAAR Nest Location Code: 30-004-01-91
Nest Description: Heavily vegetated nest in cliff cavity. Cliff height was 30 m and length was 0.03 km. Nest was 20 m from the base of the cliff and probably faced west. Accessibility was moderately difficult. Both adults were present but fairly quiet. It took 2.5 hr before they flew to the nest site. Elevation: 274 m.

Table B6. Raptor nest sites along the Noatak River, Gates of the Arctic National Park and Preserve (GAAR), Alaska, 10-22 June 1991.

Rough-legged Hawk

Location: Cliffs west of Matcharak Lake along Nushralutak Creek. 67° 45'N latitude, 156° 20'W longitude.
Nest Status: active GAAR Nest Location Code: 28-122-01-91
Nest Description: Sticknest on sedimentary cliff 100 m high by 0.5 km long. Nest was located 35 m from the base of the cliff and faced east. Nest was on top of a talus-type pinnacle on the cliff and was active in 1990. 2 adults were at the site and brooding activity indicated eggs. Elevation: 671 m.

Golden Eagle

Location: Cliffs above an unnamed creek east of Anorat Creek. 67° 41'N latitude, 155° 27'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-130-01-91
Nest Description: Large sticknest in good condition on sedimentary cliffs. Nest faced south and was very difficult to access. Several smaller deteriorating nests were also observed on the cliff and this site was best described as a nest "area". 6-10 whitewash areas. 1 golden eagle and 2 gyrfalcons observed in the area. Elevation: 1005 m.

Location: West side of drainage directly north of Pingo Lake. 67° 41'N latitude, 155° 22'W longitude.
Nest Status: active GAAR Nest Location Code: 29-128-01-91
Nest Description: Sticknest on cliff 20 m in height and 0.25 km in length. Nest was located 17 m from the base of the cliff and faces east. Nest was in good condition and was moderately difficult to reach. 1 adult and 2 nestlings observed at the site. Elevation: 732 m.

Location: Karumnulina Creek. 67° 43'N latitude, 155° 36'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-131-01-91
Nest Description: Sticknest on cliff. Active site in 1990. No additional information recorded. Elevation: 671 m.

Location: Nigikpalvgururvrak Creek mouth. 67° 43'N latitude, 155° 54'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-080-01,02-91
Nest Description: 2 sticknests on cliff face, 1 nest in good condition and 1 in poor. Access was difficult. No further information available. Elevation: 610 m.

Table B6. (continued)

Location: West of Matcharak Lake and north of Nushralutak Creek. 67° 46', 156° 20''W longitude.
Nest Status: inactive GAAR Nest Location Code: 28-126-01-91
Nest Description: Sticknest on cliff. Elevation: 594 m. No further information recorded.

Location: 67° 51'N latitude, 156° 37'W longitude.
Nest Status: inactive GAAR Nest Location Code: 28-127-01-91
Nest Description: Sticknest on small cliff right on the river. Nest in good condition and located 1 m from the base of the cliff. Elevation: 488 m.

Location: 5 km downstream from the mouth of Douglas Creek. 67° 52'N latitude, 156° 38'W longitude.
Nest Status: active GAAR Nest Location Code: 28-129-01-91
Nest Description: Sticknest on cliff 12 m in height and 0.1 km in length. Nest was 7 m from the base of the cliff and faced south. Nest was in good condition and moderately difficult to access. 1 adult and 2 nestlings (approximately 2 weeks old) were present at the nest. Nest not active in 1990. Elevation: 488 m.

Gyrfalcon

Location: Cliff north of river between pingo and Otkurak Creek. 67° 40'N latitude, 155° 21'W longitude.
Nest Status: active GAAR Nest Location Code: 29-017-01-91
Nest Description: Sticknest on cliff 15 m high and 0.20 km long. Nest was 8 m from the base of the cliff and faced east. Nest was in good condition and very difficult to access. Whitewash observed on the cliff. Gray-phase adult seen feeding nestlings that were heard but not seen.

Location: West side of Karumnulina Creek. 67° 43'N latitude, 155° 38'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-019-01-91
Nest Description: Sticknest on cliff. Active in 1990.
Elevation: 762 m. No further information was recorded.

Location: Cliffs west of Matcharak Lake along Nushralutak Creek. 67° 46'N latitude, 156° 20'W longitude.
Nest Status: active GAAR Nest Location Code: 28-018-01-91
Nest Description: Ground nest on cliff ledge. Cliff height was 15 m and length was 1 km. Nest was located 10 m from the base of the cliff and faced south. Nest condition was good and accessibility was very difficult. Whitewash at the nest and at other roost sites on the cliff. Female gray-phase adult was brooding at the nest when observers arrived and at least 1 nestling was present. Eyrie active in 1990. Elevation: 670 m.

Table B6. (continued)

Peregrine Falcon

Location: West side of canyon wall of the Kugrak River. 67° 37'N latitude, 155° 34'W longitude.
Nest Status: inactive GAAR Nest Location Code: 29-020-01-91
Nest Description: Remnant sticknest located on sedimentary cliffs. Nest faced east and was very difficult to access. Rock appears too unstable and crumbly for successful nesting in the immediate area. Rocks seen in the nest. Elevation: 610 m.

Location: 3 km upstream form Kavatcharak Creek. 67° 52'N latitude, 156° 38'W longitude.
Nest Status: active GAAR Nest Location Code: 28-002-01-91
Nest Description: Ground nest on cliff ledge. Cliff height was 20 m and length was 0.1 km. Nest was 12 m from the base of the cliff and faced east. Nest condition was good and accessibility was very difficult. Whitewash at the eyrie and on the cliff face. 1 adult and 3 nestlings (approximately 1 week old) were at the nest. Outside park boundary. Elevation: 450 m.

Common Raven

Location: Cliff face northwest of Pingo Lake. 67° 40'N latitude, 155° 27'W longitude.
Nest Status: active GAAR Nest Location Code: 29-114-01-91
Nest Description: Sticknest on sedimentary cliff. Nest was observed under a ledge by a small waterfall. Nest had a minimal amount of sticks but was in good condition. Access was moderately difficult. 2 adult birds were present, 1 incubating or brooding and the other roosting. Elevation: 730 m.

APPENDIX C. Raptor management plan for Gates of the Arctic National Park and Preserve, Brooks Range, Alaska.

November 11, 1990

RAPTOR MANAGEMENT PLAN
GATES OF THE ARCTIC NATIONAL PARK AND PRESERVE

GOAL

Gates of the Arctic National Park and Preserve (GAAR) was established as a wilderness park for the purpose of maintaining the wild and undeveloped character of the area and preserving its natural environmental integrity [Alaska National Interest Lands Conservation Act (ANILCA) 1980]. Birds of prey are a critical element of the wild and undeveloped character of GAAR and an integral component of natural ecosystems within the park. In addition, ANILCA specifically directs the National Park Service (NPS) to "protect the habitat for and the populations of... raptorial birds" [Sec. 201 (4a)]. The goal of this plan is to maintain natural and healthy populations of raptorial birds near and within GAAR, and to cooperate with other agencies in their raptor management efforts.

OBJECTIVES

1. Determine the distribution and abundance of raptor species within GAAR.

2. Monitor park raptor populations to detect changes in raptor numbers, species diversity, and nest success over time.

3. Document peregrine falcon occurrence and nesting activity in and near GAAR.

4. Cooperate and participate in interagency (both state and federal) raptor studies and efforts to address raptor protection and conservation.

MANAGEMENT ACTIONS

I. Conduct a comprehensive inventory of breeding raptors in GAAR.

Current Status

As of March 1990, <10% of the park/preserve had been surveyed for raptor nest structures and raptor sightings. Surveys completed were concerned primarily with cliff nesting raptors. The status of GAAR raptor survey/inventory efforts was summarized by Garber (1988a). Standard procedures for

recording all GAAR raptor nest sightings and observations and for conducting raptor research within GAAR are found in Appendices I and II and Garber 1989b.

Options

Several options exist for conducting baseline inventories: 1) utilize volunteer labor for inventory work and supplement with incidental raptor observations by other NPS employees, 2) hire seasonal biological technicians with raptor experience and dedication to raptor inventory work, or 3) hire a seasonal or permanent biologist to conduct a multi-year inventory project funded with I&M, NRPP, or other special funding monies.

Recommendations

Survey work utilizing volunteers and incidental reports from NPS employees (option 1 above) will usually not meet the requirements for accuracy and data collection necessary to meet plan goals and objectives. However, qualified volunteers with raptor experience are able to make significant contributions to park raptor knowledge and should be utilized if available.

Since special raptor identification skills and experience are required to conduct raptor surveys, option 2 is recommended. Preferably the person(s) conducting the surveys would return to the park/preserve for several consecutive field seasons, as work quality typically increases with increasing familiarity of the area. Additionally, hired survey staff (as opposed to volunteers) are more likely to return in following field seasons.

Option 3 is recommended only if there is an immediate need for intensive raptor inventory information in a specific area or if funding becomes available.

II. Monitor territory occupancy, nest success/failure, and productivity (young per pair) for breeding raptors within selected areas of GAAR.

Current Status

No long-term monitoring program for breeding raptors currently exists in GAAR.

Options

The size of GAAR makes park-wide raptor monitoring nearly impossible; consequently, some smaller unit(s) of the park/preserve must chosen for annual monitoring. Options for monitoring include 1) annually monitoring one river drainage system and 2) annually monitoring two drainage systems with different habitat compositions. Personnel options and

recommendations for conducting monitoring programs are the same as for Management Action I.

Recommendations

Annually monitoring raptors in two drainage systems is recommended; drainages chosen should differ in habitat type and structure. Additional criteria for establishing monitoring areas include 1) the abundance and variety of breeding raptors, 2) ease of monitoring, and 3) ease of access. The Killik River drainage (from Tulilik Lake to Lake Udrivik) is recommended for raptor monitoring in northern GAAR because it reportedly contains a high population of nesting raptors (Garber 1988b). The logistic difficulties in surveying the Killik are offset by the abundance of raptors in the area. Because of the availability of potential nesting cliffs, both the North Fork of the Koyukuk River and the Alatna River are possible choices for monitoring areas in the southern part of the park. The North Fork was surveyed in 1989 (Garber, 1989a), but the survey failed to locate the anticipated high number of breeding raptors due to inclement weather. The Alatna drainage has yet to be surveyed for raptors. For logistical reasons and ease of raptor monitoring, the North Fork (from Bombardment Creek south to the Middle Fork junction) is recommended for the southern monitoring area.

Monitoring only one river drainage in GAAR is minimal, but ensures that at least one area will be studied in sufficient detail to recognize changes in raptor numbers. The Killik river or the North Fork is recommended for single area monitoring. If a particularly good raptor area within the park is threatened, this course of action is advisable and may be required.

Monitoring all raptor species within the park/preserve is also nearly impossible, therefore, only a few key species should be monitored. Management needs, ease of monitoring, and compatibility with other state and federal monitoring projects should be considered when determining which species to monitor. Recommended species for monitoring in the park/preserve include the following cliff nesting raptors: rough-legged hawk (Buteo lagopus), golden eagle (Aquila chrysaetos), and gyrfalcon (Falco rusticolus). Additional raptor species may be selected for future monitoring efforts based on park inventory information or other data revealing a threat to a particular species.

III. Monitor peregrine falcon nesting within GAAR.

Current Status

Because of the high elevation throughout most of the park/preserve, the breeding peregrine population is probably small. Peregrine sightings have been reported for the following park areas: Killik River, Chandler Lake, Walker Lake, Itkillik Lake, and the North and Middle Forks of the Koyukuk River. There may be nesting peregrines in any of these areas.

Peregrines nest on the Noatak River and many north-flowing rivers near GAAR. The lower elevations of these rivers within the park also may hold breeding peregrines. The lower Killik River drainage, Chandler Lake, Itkillik Lake, and the Castle Mountain unit have been surveyed for peregrines. The North Fork of the Koyukuk River also was surveyed, but weather problems made the survey incomplete.

The only known nesting peregrine falcons in the park were located in the Castle Mountain unit in July 1989, when a pair with two young were located along the north-flowing Kiruktagiak River. These peregrines were probably the threatened Falco peregrinus tundrius. Birds reported on the southern slope of the Brooks Range may be either F. p. tundrius or the endangered F. p. anatum. Blood samples were taken by NPS and the US Fish and Wildlife Service (USFWS) from peregrine nestlings at an eyrie near the mouth of the John River in 1988 and 1989 to genetically determine their subspecies.

Options

Two strategies exist for monitoring peregrine falcons in the park/preserve: 1) monitor all known and reported peregrine nest sites and 2) specifically survey all potential peregrine nesting habitat.

Recommendations

Monitoring all known and reported peregrine nest sites in and near GAAR is recommended. This would allow the NPS to monitor both the threatened Falco peregrinus tundrius and the endangered F. p. anatum. Specifically surveying potential peregrine nesting habitat is not necessary at this time since by completing the overall raptor inventory (Management Action I), all potential peregrine habitat within the park/preserve will eventually be surveyed. If potential peregrine habitat is threatened by any action in or near GAAR, the NPS would be required to survey specifically for peregrines and peregrine nesting habitat in the affected area.

IV. Conduct, cooperate, and participate in raptor studies and projects with other NPS units, state and federal agencies, and academic institutions.

Current Status

No interagency or academic raptor studies are being conducted in the park at this time; however, inventories in the park in conjunction with the USFWS North Slope Raptor Surveys have been completed. GAAR has cooperated with the Noatak National Preserve in surveying for breeding raptors on the Noatak River and with the USFWS in surveying for peregrine falcons in the area of Anaktuvuk Pass. Staff have participated in designing the "Alaska Raptor Observation and Nest Record" database (maintained by the USFWS) and incidentally on other raptor projects outside of the park/preserve.

Options

NPS has several options to participate in other agency raptor studies: 1) provide planning input on study design, 2) assist with logistical support, and 3) contribute staff and/or funding.

Recommendations

For raptor studies in or near park/preserve boundaries, park staff should provide input on study design (project goals, objectives, and methodology), assist with logistical support, and consider contributing staff and/or funding. Input on study design also should be provided for raptor studies not in or near the park boundaries that will help answer GAAR information or management needs; if these needs are critical and warrant study, the NPS additionally should consider providing funds to these projects. By providing input and support for other agency raptor projects, NPS concerns and information needs will be addressed, and an interagency working rapport will be established.

GAAR should participate in state-wide raptor management efforts through direct contacts with other agency raptor biologists and through a regional NPS biologist who would represent statewide NPS raptor concerns. The park's raptor concerns and studies should be communicated with other state-wide agencies dealing with raptors. The NPS also should participate in preparing and reviewing a conservation plan for Alaskan raptors; an incomplete draft plan for Alaska raptor conservation currently exists but is outdated (Schempf 1983).

Appendix I. Standard Procedures for all GAAR raptor Conservation work.

All observations of breeding raptors will be recorded on "Alaska Raptor Observation and Nest Record Cards" and entered in the dBase raptor file. Nest sites will also be recorded on raptor nest inventory maps. In Appendix II of Garber 1988a, detailed instructions for using the park's raptor data base system are presented. An annual summary of raptor inventory work will be completed after each field season and added to the files. Data and summary reports will be available to other interested government agencies and academic institutions.

Appendix II. Methods for conducting raptor inventory, monitoring, and research in GAAR.

Raptor surveying, monitoring, and research is difficult in remote arctic areas. Virtually all raptor work in GAAR must be aircraft supported. Once in the field, workers may conduct the work from the ground, air, or some combination of the two. Choice of methods depends on resources available (money, time, aircraft availability, personnel), the type and quality of data needed, and the urgency for collecting that data. Garber (1989b) has estimated costs and comparisons of methods for conducting raptor surveys in the park.

Ground-based surveys are slow but thorough and provide the most accurate means for surveying and monitoring raptors. Ground-based observations are more accurate and complete because more time is spent in the area, optical equipment can be used, and raptor vocalizations can be identified. In the case of most tree- and ground-nesting raptors, ground work is the only workable option. Conversely, ground-based surveys restrict researchers to smaller survey areas and sample sizes (raptor observations) than do aerial surveys.

The use of aircraft (including both helicopters and fixed wing aircraft) allows workers to cover huge areas and to locate large numbers of raptors, thereby facilitating more accurate statistical analysis. Aircraft-based raptor work is difficult and hazardous in rugged terrain. Safety concerns, windy conditions, and large amounts of suitable nest substrate in these rugged areas can make aircraft-based surveys ineffective. While ground-based surveys in rugged terrain are also difficult, they may be the only way to safely survey in these areas. In most cases a combination of ground and aircraft work is advised, especially for cliff-nesting raptors. Some of the factors influencing the choice of methods are listed below:

Conduct Ground surveys:
- for woodland species
- for smaller species
- for ground nesters
- in terrain with abundant cliffs and/or deep canyons
- if accuracy is extremely important
- in previously unsurveyed terrain
- if the budget is limited
- if time and personnel are abundant

Conduct Aircraft surveys:
only for large conspicuous cliff-nesting raptors (in some cases for tree nesters such as bald eagles and goshawks)
if a large number of observations is important
if a large area must be covered
if time is limited
if personnel is limited
if most nest sites are known
in terrain where walking is very difficult
in areas with few widely spaced outcrops (or trees)

REFERENCES

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